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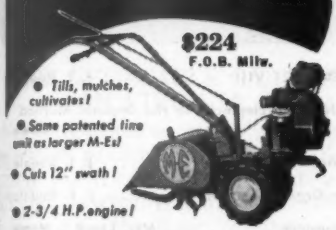

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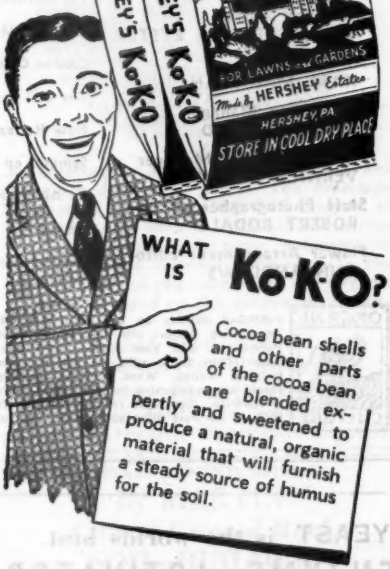

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- Editor and Publisher J. I. RODALE

Managing Editor DR. WILLIAM H. EYSTER

Art Director KARL MANAHAN

Advertising Manager JAMES F. BAIRD

Assistant Advtg. Manager VERNICE KEMMERER

Staff Photographer ROBERT RODALE

Flower Arrangement Editor ANN ANDREWS

ORGANIC CULTURE

Published monthly by ORGANIC GARDENING. Publication, Executive, Editorial, Subscription and Advertising Offices; 6th and Minor Streets, Emmaus, Pa. Subscription Rates, United States and Possessions, One Year $3.00, Two Years $5.00, Three Years $6.00. Unless otherwise directed all subscriptions begin with the current issue. Renewal subscriptions begin immediately after old subscription expires. When changing an address, give the old address as well as the new. Manuscripts should be accompanied by full return postage and a self-addressed envelope. Printed in United States of America. Copyright 1949 by ORGANIC GARDENING. Entered as second class matter January 27, 1943, at the Post Office at Emmaus, Pa.; under the Act of March 3, 1879.

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Mr. W. G. Hylton,
R. 1, Bridgewater, Va.

—o—

SOIL DEFICIENCY AND PLANT TUMORS

Last year was my first years experience with organic farming. I planted everything with compost and then learned about mulching. We mulched with pea vines. What a garden! Our berries were diseased. We had a few rows for personal use. They were covered with worts, lumps, and tumors over the lower stocks and roots of the canes. We were told it was caused by virus and is a form of plant cancer. Well, we grubbed them out and planted some next to the patch, but they were sick and puny. I analyzed the soil and found we had practically no phosphorus or potash in the soil. So just for an experiment, I applied the lacking elements and added compost and we had boysenberries two and three inches long. Last week I read an article that doctors have discovered cancer patients lack salts of potash in the blood stream. No wonder my berry plants had cancer. The new plants and ones planted on the old patch since we added the

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—o—

ROSES

It may be of interest to you to know what results I have had with roses. Where I am now living, everybody told me that it is almost impossible to raise anything in that soil, for they have already tried it and had no luck. Because I am an enthusiastic sticker to the Organic method, I determined to raise roses like they had never been raised before.

This particular locality is rather unfavorable for raising flowers, because it always gets too hot suddenly. In my rose bed I applied material from my worm beds. This material was placed on the bed at a thickness of three inches and then spaded under. My compost which I use in worm beds is made of an ordinary standard formula and after having had worms in it for six months, you can imagine the richness of the compost; well it was practically 100% worm castings.

This worm bed material was applied in the early fall of the year. After the roses were planted I immediately covered the bed with a leaf mulch to a thickness of 2 to 3 inches. This leaf mulch provides food for the soil and worms and at the same time keeps down grass and weeds and retains moisture.

To my amazement the roses grew

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as I have never seen them grow before. I prune them down to about 10 inches twice a year and twice a year they grow to a height of 5 to 6 feet. They bloom profusely in a blaze of brilliant colors. In my experience I find it best to prune them twice a year for they will bloom much better on new growth than on the old growth. Blooms look 100% better on new growth and furthermore you will have nice long stems which will make it much more desirable for cuttings.

Deep roots, watering, and keeping the soil loose are three big essentials for beautiful roses.

Hollis D. Bremer,
P. O. Box 652, La Grange, Texas.

—o—

OKRA

This time I am telling you about my okra that I grew on some ground that I was never able to grow anything on very long, until I gave it a liberal covering of compost. I took a picture of the okra and would be glad to send it to you if you would like to have it for your magazine. It grew nine feet high, and I have had all the okra I could use and gave to my next door neighbor all season. It is still bearing and I cut some of it off about four feet from the ground and it has put out shoots and has started bearing just like new plants. I also had a nice crop of cucumbers in the same ground, the vines climbed the trees and it is the first time in my life I have had to reach up for cucumbers.

I think compost is the most wonderful fertilizer that I have ever used. I keep a batch going all the time. I have lots about the center of Little Rock, on an old rocky hill side, which is nothing but shale, and crystal rocks. I was never able to do a thing with it until I started building it up with compost back in 1946. Now I am growing anything I plant. I make my compost with the raking from the garden, leaves, weeds, pine needles, hedge cuttings. I use commercial lime, garbage, and some green barn yard fertilizer. I built a pit of boards and

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ACTIVO

used rock for the opening, as I have plenty of them and they are easily moved when I get ready to turn it. Right now I have five batches in the making and two finished, ready for fall. Have used up about a wagon load the last two weeks getting my fall beds ready for planting. I would not be without compost and it makes my heart ache to see my neighbors burn up what they should be putting back into their ground.

I am getting some of them to try making compost, but most of the women would rather play cards and the men work and the commercial fertilizer is easier, so they wonder why my garden is so green and theirs are all dried up.

An old fellow came over the other morning and asked me how I grew such lovely iris. His only grew a few inches high and did not bloom. I had explained compost to his wife, but she doesn't work in the garden. Now he has retired and I told him about compost. He said he was going right back home and start a batch of compost. I told him I could almost cry everytime I saw a big smoke in his back yard.

I pay a garbage fee but there has been no garbage hauled from my place since 1946, when I started making compost. I would like to send you a bunch of pictures of the yard. It is the show place of Little Rock. I have 160 rose bushes, 35 azaleas, 15 camellias, several hundred iris of which there are at least fifty varieties. I have many different flowering shrubs and most any kind of lily you could name. I keep my garden up by replacing and building up the ground. Since I sold my place of business I stay in the garden most of the time. It is a pleasure to work in it since I have learned about compost, how to make it and how to use it.

M. M. Hitchock,
304 Thayer, Little Rock, Ark.

—o—

CORN STALKS FOR COMPOST

Last fall we dug a pit some 4 x 6 ft. and about 18 in. deep; in this we put

a layer of sweet corn stalks some 8 in. deep covering it with some 2 in. of manure and the same of dirt. This process was repeated until we had a pile about 3 ft. high. Some two months later (after the pile had stopped heating), we planted approximately 3,000 earthworms. About a month ago we began feeding these worms to draw them as near to the top of the pile as possible. Last week we took off the top nine or ten inches which contained most of the worms and placed it in other compost piles. The balance of the pile was spread on our garden. The whole mass seemed to be thoroughly mixed and there were no traces of corn stalks. This was done without turning, and it looks to us like mighty good compost.

Ralph W. Soule,
R. F. D., Box 211 AA,
Oceanside, California

—o—

SUCCESSFUL CONTROL OF MOLES

We peruse each issue of *Organic Gardening* carefully and find it invaluable as we are working hard to rebuild our half-acre of ground to highest productivity. Especially grateful are we for the article in the July, 1949, issue by Dr. Paul Scott, "Ground Moles and Their Control", because it led us to the solution of the mole problem which had grown much worse as we placed our "Crawford's Crawlers" (Domesticated Earthworms) around the garden and flower beds.

We had tried every other suggestion, from Castor Bean seeds in runways, Castor Bean plants growing, to carcasses of moles in runways, to conventional mole traps, all without success (the two carcasses were supplied by our kitten!). But in discussing the above article, the stressing of meat, rather than grains or bulbs, as being the sole diet of moles, led us to the idea of baiting traps. We had only one little mouse trap on hand—but baited it with a small piece of *fresh* Lamb (shoulder roast just ready for the oven!), and set it where a very

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busy runway came to the surface. Inside three minutes, the trap was sprung, and we had caught the first mole! Resetting the trap, we had another in ten minutes. So, within ten days, we caught fourteen moles of various sizes, at two runway entrances.

Now we keep watching various places in the garden for evidences of "moles at work", and set the traps accordingly, hoping, and finding, that the furnishing of *raw, fresh meat* will entice the moles and destroy them, and leave our "Crawford's Crawlers" free to do their good work in the soil.

We have encountered quite a bit of controversy on the subject of what moles eat—and some acquaintances followed the baited trap suggestion, but with bread instead of meat—and were unsuccessful. So we thank you for Dr. Scott's fine article—and pass our experience along to other organic gardeners.

The J. Delmar Crawfords,
(Kaeth S. Crawford),
25 Crowe Ave., Mars, Pa.

—o—

HOT CAPS

Last year I made a compost for my small garden. I used the whole leaves —then a layer of ground, 2 inches— cabbage and lettuce leaves—cow manure—then some more ground—and this I repeated until I had a pile 5 feet in diameter and 5 feet high. I made it wet and the snow was on top. This I dug in the garden and our tomato stalks were 7 ft. high and we had all the tomatoes we could eat and canned a lot. We had 30 stalks. We planted the seed under a paper hat (hot cap) and when they were about 4 inches high we set them out in the garden, each stalk under a paper hat. Then when they were all well-rooted and developed, we tore a hole in the paper hat and did not lose one plant. We did the same with pepper seeds and plants and we had all the peppers we needed, and at present we have 12

yellow and red peppers ready to use and a lot of green ones.

H. B. Burdan,
332 Walnut St., Pottstown, Pa.

—o—

BIRDS IN THE ORGANIC GARDEN

With reference to birds in an Organic Garden, I have one acre of ground, organically treated. The bird bath and bird houses, including growing fruit with compost, had made my place a bird refuge. I sometimes see 10 or 15 different species of birds sitting on the fence, waiting their turn to take a bath. And do they eat the fruit. Out of 25 grape vines, heavily laden, they pecked, ate or destroyed 2/3 of the grapes. They relish my strawberries so much, that this year I planted 1500 plants. I am sure they can't eat all the strawberries next spring. Blueberries and Blackberries I just about get a taste. I planted 5 Russian Mulberry trees to eventually give them mulberries to eat. They might then leave some fruit for me. The fruit eaters are birds of the size of catbirds, thrushes, etc. I have woods in my vicinity, and with the organic treatment of the soil, with no poison sprays used, naturally the birds will come. In previous years, I was a taxidermist, and as a solution to the fruit eating problem, I am going to put a stuffed owl or hawk among the fruit at ripening time for a week or two. This may help next year. I want the birds, and I am willing to share with them, but I would like to have some fruit for my efforts.

I spoke about the birds to a fruit farmer. He repied, "We spray our orchards, and we hardly see any birds."

Edward A. Koch,
174 Westwood Ave., Westwood, N. J.

—o—

LEAVES IN GARDENING

Last fall I raked up two big heaps of leaves from Oaks and Maples, made

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ACTIVO

two piles of these and formed them into compact heaps, this summer, when I saw that the garden would dry out if I didn't do something about it, I carted these leaves, (which had become dark and moist) in between all the rows to a thickness of about 6 inches or more, this mulch has kept my garden looking fresh and green and bearing abundantly.

Must also tell you, that I did not have my garden plowed or even turned over with a fork, I just used my hoe and stirred up the soil with it, opened a furrow and planted my seeds, the soil was so mellow and rich. I planted some beans during the hottest part of the summer. A neighbor thought they wouldn't even germinate, well I said, "I'll see that they do," here is the result of my work. On Thursday morning I opened a trench with my hoe, watered it well, dropped in my beans and covered it up, over the row I drew a thin sprinkling of compost and fine chaff, to keep the soil from drying out too much; on Monday morning my beans were above ground, taking 4 days to come up, that's a record with me, and I'm proud of it. Two weeks later I made another planting in the same way, again they took 4 days to come up. As soon as they were well above ground, I mulched them with leaves and compost, and this very day, after having picked enough beans to can and eat, they are starting a second blooming, and not

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ORGANIC GARDENING

one bean-beetle on them. I picked off a few of those yellow squishy bugs, but that is all, the foliage is still rich and green, with all the hot and dry weather we are having. Cucumber vines are lush and green, free from any bugs, a pleasure to behold. I have several squash vines that have seeded themselves, I just wish you could see them. One butternut squash I have picked from all summer and also given away, another is an acorn vine, the seed must have been in the compost heap and in that way came into my garden, because I did not plant them. I have cucumber vine and also tomato plants coming up in my flower-border. I left the cucumber vines and have reaped some grand fruit from them. I know it isn't "ethical" to have cucumbers growing in the flower-border but we love them, and can't seem to get enough of them, so I left them undisturbed. The leaves cover the ground and keep the soil moist.

I have found the soil under all the mulch moist and even though we had a temperature of 95° at times, the soil under the mulch was cool, so there is the answer to my lovely garden. Have had an abundance of flowers. Glads so beautiful, and tall, that I can pick for the house every day.

Louise S. Terray,
Pine Hill Farm, Airline Rd.,
Clinton, Connecticut.

—o—

HEALTH FROM OUR ORGANIC GARDEN

Sometimes I wish my husband had never heard of organic gardening. He has become quite enthusiastic about his garden and has been growing some very nice vegetables but the beets especially have been so huge. I was quite sure they were not eatable and have in the past managed to sneak them out to the hogs; but alas, I was finally caught in the act and had to promise to cook the next one. So there was no choice left.

Now that darned beet was so enormous I had to use my large pressure cooker to cook it and there was room for only one in the cooker. Well, to make a long story short, we have had four meals from this one beet and there is still some left. I hate to admit

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BURPEE SEEDS GROW

it but that beet was as juicy and tender as any beet I have ever eaten. Now I have to either buy some larger cooking utensils to accommodate this new variety of garden vegetable or get a new husband so you can see why I have been in despair.

I wonder how many other wives have had a similar experience. My heartfelt sympathy is theirs.

All kidding aside—and the above is true, all but losing my husband, he still kids me about feeding his garden to the hogs. I do want to say we had practically worn out soil here and have composted heavily the past three years. I have never seen such rewards as our garden has given us. We have less than an acre under cultivation and raise poultry, rabbits, ducks, and practically all we eat. We have a 15½' freezer and I fill it with these wonderful vegetables. Our friends have marveled at our self reliance.

My husband is a handicapper, having lost his right arm, but his interest in organic gardening has built him physically and the wonderful produce has been quite an aid in my family's health. We have practically no doctor bills and I feel it is due to our food.

Mrs. Dorothy M. Seamans,
How-D-Farm, 2306 Carnegie Lane,
Redondo Beach, California.

—o—

RENEWED PLEASURE IN GARDENING

I have just finished reading my first number of *Organic Gardening*, and to say I am thrilled expresses it mildly. We have been interested in a small way in composting for the past three years, but only in this last season have we done much with it. The results we got are amazing; put in just half our usual plantings of beans and doubled our crop, and our carrots, beets, tomatoes and lettuce crops were super abundant, and such wonderful quality!

I used this method on the flower gardens with the same results: physostegia so devitalized that it was a breeding ground for insects that we had to pull it all out. There was no goodness left in the soil. We used the compost and added poultry dressing. The result was beautiful plants and no insect trouble.

We thank you for the Compost book. We are now building our pile according to your directions. Can hardly wait for next spring. We are planning to use our left over compost which has not been completely composted, in our new pile.

Blanche N. Cole, (Mrs. William),
Fairholm, Fremont, N. H.

—o—

EARTHWORMS TO THE RESCUE

We have been subscribers of yours since July of 1946 and read every number of the magazine with great interest. Our problem was one of being on a sand ridge where there was just nothing to the soil, so we have leaf mulched our orange trees and imported worms into the soil around them, and this spring should show the results. The trees themselves are looking very fine and the soil under them is just wonderful. I am very tempted to dig it up and use it on my flowers but so far have resisted that temptation.

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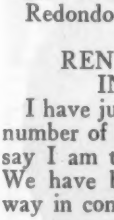

Organic Gardening is constantly striving to increase its subscription list. It is important that we tell as many people as possible about organic gardening. Perhaps you would like to take an active part in this important program by handing out our subscription booklets to friends, neighbors and acquaintances in your community. If you would like some extra money, this spare-time activity will return liberal commissions. The booklet will induce your prospect to subscribe. Through a coded coupon we can trace each subscription to your efforts.

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I have made several compost heaps. They rot down nicely, but never heat up so I know there is something lacking; it is much better than no compost at all. I have raised four boxes of worms and used the castings on my rose bushes with astounding success. Now I have two large half barrels of worms started so should have enough casting soil to spread over more than the rose bushes within a few weeks.

With the good results which we have obtained in just one year of following organic gardening ideas I am more than anxious to spread the gospel to all home owners in our section of town as it seems to be a fact that nothing will grow out here. We are disproving that belief rapidly.

Mrs. Addison O'Neill,
P. O. Box 267, Daytona Beach, Fla.

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E. M. Garrett,
2413 Lydia Ave., Zion, Ill.

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CANCER—PART VIII

SULPHUR IN FOODS

IN the last three installments of this series it was shown that sulphur is an extremely suspicious item as a cause-factor in cancer. The work of C. E. Green was described proving that it was sulphur compounds in coal smoke that were an inciting agent in producing this disease. He demonstrated also that in industries where workers came in contact with sulphur the incidence of cancer was measurably higher. In the last chapter I gave recent cases where smoke caused deaths of people in this country. For example in the smoky Loop area of Chicago there are 78.1 deaths per 100,000 white male population from lung cancer. In an outlying section of Chicago like Belmont Cragin, the figure was only 15.9 or about 20% as much. In this installment I would like to talk about the inorganic sulphur products which are put into our foods.

If sulphur that is breathed in from the atmosphere can cause cancer why isn't it possible that it can be brought about also by sulphur used in foods as preservatives? We know that the body does need some sulphur in small amounts but it should be in organic form and we can easily secure that amount through a well-rounded diet. But when to that is added man-made augmentations, not figured from a nutritional standpoint, but for convenience in manufacture or handling, then there can be danger. Why take a chance in using such chemicals until the subject is examined scientifically and the effect of such products thoroughly tested on human beings? We know that we have to eat food but we are not sure that it is good to eat sulphur in a non-food, chemical form. Knowing what we do about Green's findings against sulphur, we are justified in being on the alert when it comes to the matter of permitting food processors to add sulphur to their food products. This is a question that must be looked into by the U. S. Food and Drug Administration and the medical profession.

The question arises, should a known cancer case exercise more than normal caution with regard to sulphur? Besides not eating foods which have been "enriched" with sulphur, should he or she stay away from foods that are high in sulphur content? That is a matter for the physician to decide, but merely for the record I am giving a list of foods that are in the highest brackets of sulphur content.

They are: almonds, peanuts, walnuts, clams, lobsters, oysters, lean beef, American and limburger cheese, eggs, dried lima beans, lentils, mustard greens, dried peas, watercress, barley, yellow corn, oatmeal, whole rye, whole wheat and wheat germ.

There are two pieces of recent research in cancer chemistry that have come to my attention which again throw suspicion on sulphur. I will give you the first one in the words of the *Science News Letter* of October 1st, 1949:

"A chemical clue to a cancerous condition of the white blood cells, called myelocytic leukemia, was reported by Drs. Albert A. Dietz and Bernhard Steinberg of the Toledo Hospital Institute of Medical Research. Bone marrow in such cases was found to have an abnormal amount of inorganic sulfate." The implications and intimations here are terrific. I want to quote

from a book called *Minerals in Nutrition* by Zolton T. Wirtschafter, M. D., Clinician (Diabetes) of the Mount Sinai Hospital, Cleveland, Ohio, published by Reinhold, 1942. He has an entire chapter dealing with sulphur. He says: "Plants probably can form protein from the inorganic sulfates, but animals cannot. Small amounts of inorganic sulfate are found in the blood and tissues of animals," which includes man, of course.

Now, Drs. Dietz and Steinberg found excesses of *inorganic* sulfate in the bone marrow in leukemia. Since it is an accepted medical fact that man cannot assimilate inorganic sulfates, and since so much of our foods, water, and medicines are made up of or have inorganic sulphur added for various purposes, and, since Green also has shown the part that sulphur plays in cancer, do we not here have a basis for the beginning of medical research, that might lead to making a breach in the seemingly impregnable citadel that is cancer?

As I have said before, we *must* have some sulphur and we secure that from our food in the organic form, but when we add the inorganic forms of the sulphur, in medicinal, preservative or antiseptic functions and when we breathe in inorganic sulphur compounds from a smoky atmosphere, are we placing into the body a substance that is foreign to the normal operating of the bloodstream and the tissues?

Dr. Wirtschafter, in the above-mentioned book, gives more incriminating information against sulphur. He states: "—the marked discoloration that occurs in conditions like Addison's Disease, and in certain tumors, contain sulphur." He also states that in kidney disease the inorganic sulfate concentration of the blood is increased. He says that as the sulfate concentration in the blood serum of kidney cases increases, to that extent are the kidneys prevented from concentrating urine. He says that, "A retention of the sulfate is an earlier indication of kidney impairment than is afforded by other symptoms."

There is a statement in this chapter by Wirtschafter which must be mentioned. He says that the saliva of smokers contains a greater concentration of thiocyanates than that of non-smokers. Thiocyanate is a form of sulphur which is converted from the poisonous cyanides. Here is a point well worth considering. Tobacco contains sulphur. By lighting it up we get a process similar to the burning of coal, the formation of smoke and ash. In the smoke, we then find the sulphur in compound forms which may be dangerous, just as they were shown to be in coal smoke. But in the case of a smoker, he recklessly takes this smoke into his mouth and many swallow it, some coming out through the nostrils. Therefore it is noted that the saliva of smokers contains more sulphur than that of non-smokers. These items are all self-explanatory and indicate a need to study further, the effect of sulphur on the body.

An important piece of research was done recently which throws a little more light on the presence of sulphur in cancer. Under date of September 24, 1949 the *Science News Letter* published the following:

"Creation of a new kind of substance for finding chemicals involved in cancer and other chemicals basically responsible for muscle movement was announced by Dr. H. S. Bennett of the University of Washington Medical School in Seattle.

"The new substance is a chemical compound that contains mercury. When it combines with a special type of sulfur-containing compound, it signals the sulfur compound's location in red so that the scientist can see where the sulfur chemical is. The particular sulfur chemicals located are ones containing a combination of sulfur and hydrogen known as sulfhydryl. The sulfhydryl combination is important both in muscle functioning and in cancer chemistry."

This gives sufficient evidence to show that sulphur is involved in some manner in cancer. It shows the need of examining every phase of the introduction of sulphur into the body. As

a layman I would like to humbly suggest that a process might be worked out of de-sulphurizing a cancerous body of its excess inorganic sulphur content. It may of course turn out to be impossible, but an attempt should be made at it.

In connection with hardening of the arteries a similar procedure has been discovered to be of benefit. In this disease an abnormal amount of cholesterol is found in the blood plasma. A technique of de-cholesterolization has been effected by administering choline, inositol and pyridoxine which are parts of the vitamin B Complex, which reduces the cholesterol in the blood. Cholesterol is usually found in fats and patients with hardening of the arteries are warned to reduce their intake of fatty foods.

Dr. Wirtschafter, in his chapter on sulphur, gives a hint on one way of ridding the body of some sulphur. He says that the "amount of sulphur excreted daily (in the urine) depends upon the sulphur intake, which in turn depends upon the amount of protein that is eaten or metabolized ..... On a high-protein diet both the total sulphur and the inorganic sulfate excretion are increased." There seems to be a relation in constant proportions between the amount of protein eaten and the sulphur excreted—the more protein eaten the more sulphur excreted. Should a cancer case go on a very high protein diet? Should special kinds of protein be injected into their bloodstream?

A very interesting question is involved here. As I indicated in part IV of this series, "Cancer appears to be a disease in which there is a definite derangement in protein synthesis." It is the protein in the nucleus of the cell that is involved. Now we see that the protein affects the sulphur. It would be well here to go back to chapter IV and read again the significance of protein in cancer. It was shown there that it is not only the quantity of protein that is in question, but also its quality. Enough evidence was adduced to show that the use of chemical fertilizers and other practices of our present-day highly commericalized farming may be giving us a protein of inferior quality. We know that it is producing less protein in the plant. The plant cannot work with the nitrogen it gets from artificial chemical fertilizers as well as it can with the nitrogen obtained from decayed manure and other organic matters. It is the nitrogen that is the most important constituent of protein. When we introduce these inorganic forms of nitrogen into the plant, we then are confronted with disease in the plant which ends up with the running out of the variety. The plant eventually loses the ability to perpetuate itself. Now, since protein exerts a healthy influence in helping to rid the body of unwanted sulphur we must look to the quality and quantity of protein that is made available to people. The medical profession, then, it seems, must become more involved in agriculture. The two fields are intimately related and interlocked.

Wirtschafter says: "When the protein intake is adequate, sulphur intake is not a nutritional problem." That statement is very encouraging in the consideration of the cancer problem. But of course, Wirtschafter is concerned merely with the *amount* of protein. I don't believe that the good doctor is aware of the controversy that exists between the agricultural chemistic school of thought and the organiculturists, of whom there are hundreds of thousands practicing in the United States right now, and who believe that they can get a healthier food, with a better protein, by using only organic fertilizer materials like manure, grass clippings, leaves, etc. Were we to eat a diet produced in that manner, we probably would not have to worry about the excess, inorganic sulphur that we get in many undesirable ways and sources. Our bodies would develop a resistance to all kinds of abuses. It is a weak body that succumbs. Healthy tissue of a healthy body does not go cancerous.

Now that we have learned a little about the significance of inorganic sulphur to the ill-being of our body, but especially as it relates to cancer, let us

examine a few cases where such sulphur is found in foods and medicines. First we have the age-old remedy which people used to take in the spring —sulphur and molasses. It no doubt acted as a tonic just as a small amount of the poison, arsenic, can. But what is the effect of taking it year in and year out, especially where the body takes in other sulphured foods, and breathes in sulphur-polluted air? We cannot say. But let us go down the list and see what other things we find.

Many food products use the cheaper glucose rather than cane sugar. The glucose is made by applying sulphuric acid upon starch. It is used in candy, soft drinks, cakes, pies, ice-cream, canned fruit, etc. It costs half the price of cane sugar and makes a clearer looking candy. Dr. Harvey Wiley the first head of the Federal Food and Drug Administration did everything in his power to draw attention to the danger of using glucose, but all he received for his pains was a dismissal from the Department. In 1912 Doctors Lukens and Dohan of the University of Pennsylvania discovered that mice fed on glucose became diabetic whereas the same amount of cane sugar did not cause it. Diabetes is a degenerative disease, a general classification which is used for cancer also. Bear in mind that sulphuric acid was used in making the glucose.

In many states it is permitted to use sulphuric acid in making corn syrup. Our own State of Pennsylvania has a law against it, which is clear recognition by a governmental body that there is a danger in using sulphuric acid with foods. The State could very well conduct a general investigation into the whole question of sulphur in foods and in the atmosphere.

Baking powder usually contains alum which is made with sulphuric acid and aluminum, both highly toxic elements. It also contains sodium which is not a too desirable food item. In a book called *Chemistry and Cookery* the authors, Macleod and Nason say:

"A product made by a baking powder high in phosphate may form a rather unpleasant coating on the teeth if taken in large amounts, as when one makes a supper of waffles. It could easily be proven that an excess of Rochelle salts affects the kidneys. Similar undesirable effects can be shown with excess of residues of other baking powders."

Rochelle salt is sodium-potassium tartrate, which does not contain sulphur, but who knows the ultimate effect on the human organisms of sodium-potassium tartrate made synthetically. Incidentally, alum (made with sulphur) is used by many cities along with chlorine, to disinfect city drinking water.

Many processors of figs, prunes and apricots sulphur them. In purchasing such fruits watch the label. There are now on the market such fruits which the labels indicate are non-sulphured. In my book *The Healthy Hunzas* (Rodale Press), it is shown what a staple food apricots are to this healthy people, among whom cancer is nonexistent. They sun-dry their apricots and they keep well all winter. It is a known fact that where food is grown without chemical fertilizers, but instead is made healthy with the application to the soil only of decayed organic matter such as manure, weeds, leaves, etc. the food product is sounder and its keeping qualities are better. This is not merely theory. I have seen it in many cases and the literature and records prove it. Therefore food produced in such manner would require less or no preservative poisons. The Hunzas of Northern India have no chemical fertilizers, poison sprays or sulphur, but they do have manure and other organic matter. Modern agricultural methods with their accent on chemical fertilizers and poison sprays will not give food which will stay in cans without preservatives.

Wine makers up to recently were using sulphur dioxide to stop fermentation at a certain point so that the wine would not turn into vinegar. The wine people recently changed over to monochloracetic acid because they found certain disadvantages in the use of sulphur dioxide. The Food and

Drug Administration however stopped them as they found the monochloracetic acid to be toxic. Will the wine people now go back to sulphur dioxide? Will the Food and Drug department accept such a product? The same acid was being used for beer also and 245,000 gallons were destroyed. Will the beer manufacturers now use a sulphur product for their nefarious purpose? The use of monochloracetic acid recently in an orange drink caused an epidemic of vomiting and diarrhea, which was nature's attempt to repudiate a spurious substance forced on the body.

Two apparently innocuous products which come from coal tar made by heating with sulphur are saccharin and aspirin. Saccharin's prolonged use in the case of certain suseptible people does serious damage to their livers. A title of a book that has just been published shows that not a little aspirin is being consumed today. The title is, *This Aspirin Age.*

In the next issue, the discussion will be continued on foods that are doctored up with sulphur compounds. In the meantime watch the labels in this game of "Who is fooling who?"

(To be continued)

ENZACTIVATOR

A New Development In The Organic Method

By J. I. RODALE

ABOUT six months ago I had business that took me to Washington, D. C. As I had three or four hours left of the afternoon after the conclusion of my transaction, I bethought myself of the U. S. Patent Office and what a wealth of information reposed in its tremendous archives. I had often thought that in the field of fertilizing and compost-making there must be many patents, new and old, which would be interesting to look over. Perhaps, even if only one little crumb of valuable information came out of it, the time spent would be well worth while.

I found many patents that were interesting, but one of them, was the "crumb" I was seeking, and in my opinion it is so important that it has terrific possibilities. Up to now, in the consideration of the organic method we have been talking about such things as organic matter, humus, bacteria, nutrients such as phosphate and potash, etc., but rarely has the word *enzymes* been used or spoken about. The patent that I found, and which expired in 1948, deals with a method of making enzymes. It can now be utilized by anyone without paying a royalty, for a patent has a protection period of only 17 years.

This patent was taken out in the U. S. Patent Office on February 10, 1931 by Kazuyoshi Yamaji of Tokyo, Japan. It is Patent Number 1,791,918. The patentor says that it is a "Powdered deodorizer for the acceleration of ripening of organic fertilizers."

Enzymes, substances made up of protein, are found in plants and animals and are capable of producing chemical changes in other substances, by catalytic action, that is without itself being changed or consumed. Eventually, through wear and tear, the enzyme disintegrates and must be replaced. In other words, an enzyme does not last forever. Enzymes make possible digestion of foods, respiration, and the functioning of body tissues and organs. All living processes in plants and animals are influenced by enzymes. A popular example of an enzyme is pepsin in the stomach which aids in the process of digestion. The saliva consists mainly of a dilute solution of an enzyme called salivary amylase, which converts starch to sugar. The making of alcohol and carbon dioxide from sugar and yeast is accomplished by the action of enzymes.

An enzyme is not a bacterium. It is created by the living cell of a plant or an animal, including bacteria. In the cell, of which there are billions in a plant, there is a little world which operates a vast multitude of activities. This tiny cell builds enzymes from substances it draws from the blood or from the nutrients drawn in by the roots of a plant. In a plant, therefore, the enzymes are made by substances obtained directly from the soil, which shows how important it is to grow a plant in a healthy soil, and not in one saturated with poison sprays and concentrated, too soluble, chemical fertilizers. Once they are produced, the enzymes are almost indestructible, and even life itself is not necessary for their actions.

In the break-down processes of organic matter not only bacteria and fungi take part, but also enzymes. We know that the latter play a prominent role in the decomposition of carbon compounds which are the most prevalent constituent of organic matter. The finding of this patent, giving a method of making enzymes, may be the beginning of a series of researches, which will improve the organic method and make it even more scientific than the chemical fertilizer method of today.

In going back to this patent, Yamaji says:

"The object thereof is to mix it with such organic fertilizers as the excrement of live stock, fish or animal manure, etc. so as not only to accelerate their ripening, but to prevent the growth of harmful bacteria and the escapement of the ammonia which is the last product of the decomposition, and at the same time to stop the disagreeable odor produced from these kinds of manures.

"The matters discharged by animals more or less vary according to animals and the food taken by them, but consist principally of protein, for example, albumin, globulin, nuclein, peptone, mucin and their decomposition products and next of carbohydrate, for instance starch, cellulose, sugars and organic acids. These matters, when decomposed, usually produce substances of disagreeable odor such as indol, skatol and other sulphides. The known deodorizer does not remove these substances of disagreeable smell, but simply offsets the disagreeable odor temporarily by its own good smell and does not prevent the production of these substances. Also, when various kinds of excrement are used as fertilizers, they must be ripened, and no deodorizer has ever been known to accelerate the ripening of fertilizers and at the same time to stop the offensive odor caused by their decomposition.

"However, the deodorizer produced by the present invention ripens rapidly such organic fertilizers as animal excrement, fish manure, night-soil, etc. when it is mixed with them. Moreover, it prevents not only the growth of harmful bacteria, but also the escape of ammonia, the last product of the decomposition, and at the same time stops the disagreeable odor caused by the decomposition of the fertilizers. The essential feature of this invention consists in mixing dried and powdered cereal containing a large quantity of enzyme with rice-

bran, barley-bran or wheat-bran and adding a small quantity of water thereto, after which it is heaped for fermentation and then is dried and powdered and finally is mixed with tricalcium phosphate and powder of germinated seeds of cereal such as barley, wheat, bean, etc. which contain a large quantity of enzyme. If this deodorizer is sprinkled in water closets or on other filthy matters or various kinds of organic fertilizers, it will saccharify the starch by the powerful enzyme contained therein and supply sufficient nutrition to yeasts and bacteria so as to make their breeding vigorous and thus drive out the other harmful bacteria.

"On the other hand, it accelerates the decomposition of albumen and converts it into an intermediate product free from unpleasant smell. Also, it fixes the ammonia produced by the organic acid and the superphosphate produced by enzyme and prevents its escape and thoroughly suppresses its bad smell.

"The following is an example of carrying this invention into practice:

"Mix well about 3.75 kilograms of dried and powdered cereals containing a large quantity, preferably of hydrolytic and proteolitic enzyme, for instance, barley, wheat or bean with about 37.5 kilograms of rice-bran, barley-bran or wheat-bran and add thereto about 24 litres of water. Then, heap the mixture for fermentation, after which it is dried and powdered and finally is mixed with about 3.75 kilograms of dried and powdered germinated cereal containing a large quantity of enzyme, for example, barley, wheat or bean and about 3.75 kilograms of tricalcium phosphate. The above mixture, when added to organic fertilizer, accelerates its ripening, and, when sprinkled in places which usually emit unpleasant odors, such for instance as water closets, eliminates such odors."

Instead of tricalcium phosphate I would use phosphate rock. It is much cheaper and contains over twenty rare mineral trace-elements as well as the calcium and the phosphate of the tricalcium phosphate. Here are the instructions I issued to our gardener who since has made 3 batches of this material, in ever increasing quantities.

Japanese Enzyme Activator

1. Mix 4⅛ lbs. of dried and powdered wheat with 4⅛ lbs. of dried and powdered barley, from our own stock.

2. Mix a total of 82½ lbs. of bran of wheat, barley, rice or bean (purchased). If all cannot be obtained, confine to 3 or 2 or 1, but there should be a total of 82½ lbs.

3. Then mix batches 1 and 2 together thoroughly and add 25-1/3 quarts of water (rain water is preferred).

4. Then heap the mixture for fermentation, after which it is dried and powdered and finally is mixed with about 8¼ lbs. of dried and powdered germinated cereal (½ wheat–½ barley) of our own, and 8¼ lbs. of phosphate rock.

As soon as the first batch of this enzyme activator was ready we tested it. It so happened that we were about to grow beans under ten different conditions for another purpose and decided to treat two of the pots with the enzyme activator. Unfortunately, in this test there was not one pot with compost as a comparison. Therefore we do not have such a comparison. The yield with this activator was excellent, but two other important facts were noted. The color of the leaves was the best in these two. Also the plants stood up ruggedly on their own legs. This is an important point which might indicate that the plant is securing sufficient potash, because it is potash that aids a plant to have rigidity. This winter, in our hothouse, a more scientific test will be made with this enzyme activator in growing plants.

A few words about how to go about making some of this enzyme activator, which might be given the special name of enzactivator. We are making ours using wheat and barley seed. Such grain can be purchased from feed dealers. Look at your newspaper

for daily quotations of these grains, as a guide to the selling price. A farmer may use his own crops, but if he wishes to make it in larger amounts he may find it to his advantage to buy the grains. The question as to whether a farmer will find it economically feasible to apply such a fertilizer depends on many factors and will have to be studied out and tested.

However this enzactivator may have special applications on the farm. For example, it could be mixed with the chicken mash and with animal feeds. I believe it would be a healthy addition to their diet, but in such case I would leave out the phosphate rock on account of its high fluorine content. It could be an excellent treatment under fruit trees in an orchard. It is especially recommended in the gutters of cow-barns to reduce odors, tie in the nitrogen and start the process of ripening of the manure. As far as cost is concerned, the materials would come to about fifty dollars a ton. 250 pounds to the acre might do wonders. It is in powdered form and could be applied to the land in a grain drill. For oats that have a tendency to lodge it may be perfect, because our experiment showed that the enzactivator made it stand up.

In the garden it may be a boon if used as a fertilizer along with organic matter. It could be mixed with dressings of such material that is dug into the soil at the end of the season and will aid its decay, as well as furnish valuable additional nutrients. The beauty of it is that a batch of enzactivator can be made in about three weeks, and used immediately with a planting. To me, this is the most exciting development that could have been added to the organic method, because it furnishes what I believe to be a wonderful fertilizer, full of enzymes, which will give us even higher quality in growing plants than we have been getting.

How to Make It

First you must find a method of grinding the wheat and barley coarsely. A machine has been advertised in Organic Gardening for grinding grains. Sears Roebuck and Montgomery Ward also have such machines. After it is ground and mixed with the bran (one kind of bran will do) and the water applied, put it in a heap on a floor to ferment. If it gets dry add a little water from time to time. After two or three weeks it is ready to be mixed with the powdered sprouted grain.

In sprouting the grain, it can be placed on shallow pans with holes for the water to drip out. The grain is placed in these pans about one half inch to one inch thick and in a few weeks will sprout. The sprouts do not have to be more than about a half inch to an inch. Keep watering. We will soon run a series of articles on different methods of sprouting grains.

Seeds As Fertilizer

For the gardener it may also be practical to use ground up seeds as a fertilizer. Seeds such as beans, soybeans, wheat, barley, oats, sunflower seeds, etc. ground up and put into the soil about two weeks before planting the crop will furnish excellent fertilizer value, including vitamins, minerals and enzymes. This is a method of insuring that rare trace elements get into the soil, because seeds usually contain them. A hundred pound sack of wheat costs but three dollars or so. It is cheaper if you buy it from a farmer. Eventually certain mixtures of seeds can be figured out, including legumes such as soybeans, to give a balanced nitrogen, phosphorus and potash content.

Japanese Method With Night Soil

In the orient where a great deal of human excrement is used as a fertilizer they have found that to hasten the breakdown of the material, a few handfuls of powdered soybean is quite effective. Enzymes in the soybean speed up the breakdown of organic solids. By doing this the period of putrefaction is reduced to one or two weeks.

A LETTER AND AN ANSWER

By J. I. RODALE

The evidence of the superiority of organically produced foods to human health

THE following is a letter I received a few days ago from a reader of *Organic Gardening*. It was of sufficient importance to justify a thorough reply. I am deleting the name of the sender. Here is the letter and the answer.

Dear Mr. Rodale:

Your ideas about compost grown food and its relation to health and disease have interested me for a long time. Common sense tells me that your methods are superior to artificial methods of agriculture—at least one has nothing to lose and everything to gain by giving it a try.

So you will understand my purpose in writing this I must tell you a few things about myself. I am a pre-medical student enrolled in the college of Home Economics at Syracuse University. My major is Foods and Nutritional Research. One of my courses requires a 45 minute talk to a mixed group of faculty and students on any topic concerned with foods and nutrition. The choice of the topic is left to me providing it is approved by my professor. I chose the topic dealing with the relationship of poor and diseased soils to poor health and disease.

I find that there is hardly any publicized research work in this field. My Professor doubts your claims of compost grown food being superior to artificial fertilizer grown foods. I cannot use your magazine *Organic Gardening* because it is written for the layman. If you can supply me with records of scientifically controlled experiments showing conditions for growth and a comparison of the resulting food analysis I will be very grateful to you. If you have nothing of this sort you may be able to refer me to some scientific publications with published reports of others interested in this field.

I am particularly anxious to prove your theories to my nutrition Professor since she has taken a rather negativistic attitude which seems to be typical of the attitude of the whole dietetic and Medical profession. Only occasionally have I run across published articles sympathetic to your work.

My Professor accused you of being a fanatic. In this respect I agree with her, but I see nothing wrong with being a fanatic if one has examined the facts and has convinced himself that his conclusions are correct. You will no doubt readily understand my situation—having to get material from officially recognized sources—getting material from people with degrees, etc.

This is not the end as far as I am concerned. Upon completion of my future medical training I intend to follow this field of medicine very closely for I am convinced it is fundamental to the health of the nation. So in helping me now you may help me to help you a few years hence. Thank you for anything you can do for me.

Sincerely yours,

.....

Dear friend:

I am in receipt of your letter and will see if I can aid you in your quest for information. First, I am enclosing herewith a bulletin of the Soil and Health Foundation summarizing the results of an experiment with two groups of mice, one fed on food raised organically, and the other with chemical fertilizer, carried out by Dr. Ehrenfried Pfeiffer. It shows significant benefits to the group fed organically. In one respect it showed that the chemical group was much more nervous. There were many more deaths from fighting and other causes in the

chemicalized group. There were other advantages to the organically fed group and those who watched this experiment did not have to be experts to see which group was healthier. This experiment was done under extremely scientific conditions.

A most convincing experiment was carried out by M. J. Rowlands and Barbara Wilkinson, research workers, who reported their findings in the *Biochemical Journal,* Volume 24, No. 1, 1930. The article states in part:

*"'This research was undertaken because one of us (M. J. R.) had noticed that pigs which were fed on home-grown and home-ground barley and wheat always did much better than those pigs which were fed on purchased barley and wheat, and that certain cattle did better on certain fields. It was decided to find out whether this was due to the lack of lime or of other mineral constituents of the land. The results of this investigation were not satisfactory. It was then decided to try the effect of artificial manure (chemical fertilizers) versus dung. A crop of clover and grass was grown, one-half fertilized with dung, the other half with chemical fertilizers including basic slag, kainit and sulphate of ammonia. Then rats were tested by feeding them the product of these fields.....

.....the rats were divided into two lots; one lot was put on a deficiency diet to which was added 20% of the 'dung' seed, the other on deficiency diet with 20% of the 'artificial' seed .....The rats on the 'dung' seed showed good growth or a slightly subnormal growth.....The rats on the 'artificial' seeds all grew very poorly, not one giving normal growth.....It can be seen that the former have gained nearly twice as much as the latter .....The rats on the 'artificial' seed were in a poor condition; in some the hair was falling out."

Sir Robert McCarrison in 1926 in experiments with grains at Madras, India, discovered the same thing. He found that if grown organically they contained more vitamins. For further information see the Journal of Indian Medical Research, Volume 14:351, 1926, where his findings were summarized.

**"In April, 1941, an experiment of tremendous significance was described by Professor Glen Wakeham of the University of Colorado before an American Chemical Society meeting at St. Louis. This experiment proved that garden beans and peas grown in poor soil had a greater mineral content than those grown in rich soil. By rich soil was meant soil that was 'enriched' by the usual chemical or commercial fertilizers with the possible addition of manure.

"Professor Wakeham said: 'While millions of dollars are spent annually in research to produce greater crop yields, and other millions to discover ways of disposing of the surplus crops thus produced, almost no attention has been paid to the nutritional values —particularly with regard to essential minerals—of the artificially forced and 'improved' crops obtained. If the present observations prove to be examples of a more or less general phenomenon, crops grown on 'poor' soils should command higher prices than those grown on 'rich' soils.

" 'More fantastically,' it has been suggested 'that tribes and nations living in agriculturally poor countries —high, windswept plains, mountainous districts and arid semi-deserts— have usually conquered the inhabitants of the rich river valley and coastal plains because they have 'more iron in their blood and more grit in their bones.'

"For years nutritionists have pointed out that many average American diets are likely to be deficient in calcium, phosphorus, iron, iodine, etc., causing such deficiency diseases as rickets, anemia, dental decay, and 'simple goiter.'

"Thousands of analyses have shown that while standard foods will usually contain fairly uniform amounts of the great food elements—proteins, fats,

* Part III Health or Disease From Food Pages 303 and 304
** Pay Dirt Pages 126 and 127

sugars and starch—their mineral contents may vary widely. Some samples of spinach, for example, contain seven times as much iron as other samples."

The significance in this experiment is not that the poor land gave more vitamins than the commercially prepared one, but that the latter, with its chemical fertilizers gave less than the scrub soil. This shows the danger of using these chemicals which tend to lock in the trace-elements and inhibit the multiplication of the right kind of soil organisms. The soil left to itself would produce healthier crops than with chemical fertilizers, although the yields would be less. To get maximum yield and maximum health qualities, organic matter must be added.

Another scientific experiment carried out by Dr. Pfeiffer with chickens is explained in Chapter 12 of *Bio-Dynamic Farming and Gardening* (Published by the Anthroposophic Press). The organically fed chickens were stronger, laid more eggs, and produced a more hatchable egg. In the chemically fed group only 35% of the eggs hatched. In the group where the chickens were fed on feeds grown organically, hatchability was 68%.

In the same book Dr. Pfeiffer gives in great detail, pages 185 to 190, the details of experiments carried out with turkeys in feeding with chemically fertilized feed as against feed produced with stable manure. The article summarizing his results, entitled *The biological value of the products of soil fertilized with animal or with chemical fertilizer* was published in the Proceedings of the R. Accademia Nazionale dei Lincei, Mathematical, natural scientific division, Vol. XIII, series 6, 1, Rome, February 1931. The results were spectacular. The turkeys fed with food grown with stable manure showed a smaller number of cases of sickness, a shorter duration of it and a far lesser number of deaths. He summarizes: "This means that the seeds, and still more the leaves of plants fertilized with stable manure have the peculiarity, when used as food for these animals, of increasing their capacity for resisting disease to a greater degree than the corresponding seeds and leaves of minerally fertilized plants. The former have thus a higher biological value than the latter." The stable manure also produced higher yields in the plants.

In Dr. Pfeiffer's book mentioned above Pages 190-191, the author mentions three German physicians, Schulz, Reinhardt and Kalkhof who wrote articles in German medical magazines giving their experiences in effecting cures of patients with the use of organically produced bread and other products. They cured a series of metabolical disturbances. They found it especially effective with weak and backward children, and to have a definite influence on the functioning of the stomach and intestines. They have thus cured, without medications, cases with marked stomach troubles and sluggish intestinal activity.

***"The Lancet, English medical journal, reported a case in New Zealand similar to that of the English school: 'In 1936, Dr. G. B. Chapman, of the Physical and Mental Welfare Society of New Zealand, persuaded the authorities of a boys' school hostel to grow their fruit and vegetables on soils treated with humus. This has since been done, and a striking improvement is reported in general health and physique, particularly as regards freedom from infections, alimentary upsets and dental caries.'

"The N. Y. Times on June 30, 1940, also discussed this case, identifying it as the Mount Albert Grammer School. According to the Times: 'Dr. Chapman advised that a change should be made from vegetables and fruits grown in soil fertilized by chemicals, to produce raised on soil treated only with humus. The results were startling. Catarrh, colds and influenza were greatly reduced and in the 1938 epidemic of measles, the boys had only

*** Pay Dirt Pages 139 and 140

mild attacks whereas new admissions succumbed readily.'"

Another case is that of the workers of the Winsford Bacon Factory in Cheshire, described on page 141 of my book *Pay Dirt,* (Devin Adair Co., N. Y.). The company provided 150 workers with two meals a day, the food coming from soil treated only with humus and no chemical fertilizers. The results were startling; the general health of the worker has improved; there is less absenteeism; the *esprit de corps* is excellent and work is going with a swing.

Another experiment worthwhile recording is that of Dr. J. W. Scharff, Chief Health Officer of Singapore, who fed 500 Tamil coolies on organically produced food. See page 142 of Pay Dirt for a full account. A surprising improvement in stamina and health of the coolies was noted.

Take the case of the chickens on my own farm of which there are about 150. We grow all the feed for them organically, no chemical fertilizers being used. There is absolutely no disease and no deaths except on account of old age. Chicken diseases are so prevalent today that we can safely say that at least 20% of all chickens will die or be destroyed because of them. Recently the owner of one of the largest chicken breeding establishments in the world came to see our chickens and was surprised at their healthy appearance. He stated that they were losing over 20% of their chickens from leucosis. I do not even know what leucosis is or any other chicken diseases because I have never had any contact or experience with them. When I began with chickens I began with the organic method.

The chicken breeder was amazed at the fact that I permitted him to enter the chicken house, especially after he had told me of the disease of his flocks. It is standard practice in chicken raising not to permit other poultrymen to tread where their chickens do because on the bottom of their shoes they may carry the organism of some chicken disease and may infect his flock. I not only invited him to come in but asked him to rub his shoes vigorously in the litter. A few months ago I showed through our chicken house 80 G. I. young farmers in groups of 20. Most of them raised chickens. I asked them all to rub their feet in the litter, because due to the food the chickens ate their resistance to disease was greatly developed. Not one chicken contracted any disease.

Should not the same theory apply to people? In our family of five, four of us are much healthier than the average person, because we eat food that is organically produced. But we cannot say the same about our 20-year old daughter who spends 9 months of each year at college. She has a record of colds, sickness, fevers, etc. But wait! when she finishes her schooling we will fix her up.

I sympathize with your position dear student. Ask your professor to come to our chicken house, even to come to our house and examine each one of us. Also ask her about the terrible foods and diets fed people at hospitals, sick people, who need the finest foods, fed on white breads full of preservative poisons. There is a field for you, a crusade to get better foods served in hospitals.

Coming back to the chicken breeder, as a result of what he saw at our place he has decided to purchase a 500 acre farm and produce all his own feed organically. Now it comes in by the carloads from the large western farms, from the food factories which buy their chemical fertilizers by the carloads.

Let's rush through a few more pertinent facts. Last summer (1948) we took some oranges raised organically by Mr. John E. Volkert of Orlando, Florida and the same variety of orange raised by a neighbor of his with chemical fertilizers. The two batches were sent to The Pease Laboratories, N. Y. C. Mr. Volkert's oranges had 30% more vitamin C than the chemical ones. At the same time we sent two batches of wheat to the Pease Laboratories — one from our farm, raised organically, the other from a neighboring farm that uses chemical

fertilizers. Ours had 40% more thiamin (Vitamin B_1). Significant?

There is a host of scientific information available in the literature to prove that the use of organic matter in the soil makes for healthy plants. I will quote a statement by Dr. Selman A. Waksman, the discoverer of streptomycin from his book, Humus (p. 409):

"Plant deficiency diseases are usually less severe in soils well supplied with organic matter, not only because of the increased vigor of the plants but also because of antagonistic effects of the various soil microorganisms which become more active in the presence of an abundance of organic matter." At the Connecticut Agricultural Experiment Station this was confirmed in experiments with fusarium rot of squash seeds (Bulletin 500, Nov. 1946, Physiology of Fusarium Foot Rot of Squash).

That chemical fertilizers could be detrimental to human health was shown by a Government scientist connected with Cornell University. In the January, 1949 issue of the Agronomy Journal, in the article by Dr. J. K. Wilson, entitled *Nitrate in Foods and its Relation to Health* the summary was as follows:

"Leafy vegetables, frozen foods, and prepared baby foods were analyzed for their content of nitrate. From the findings it is suggested that the nitrate in such foods may contribute to hemoglobinemia found in infants and may produce certain toxic, if not lethal conditions in adults. The high content of nitrate in the foods may be attributed in many instances to the application of nitrogenous fertilizers, especially nitrate of soda, to the growing of crops." See my editorial in April, 1949 *Organic Gardening* regarding this article.

Dr. Oscar T. Eichman who heads the Agricultural Chemistry and Soil Department at Long Island Agricultural and Technical Institute at Farmington, L. I. made experiments in fertilizer use with organic nitrogen as against that synthetically made and used in chemical fertilizers. His results were so startlingly in favor of the organic product that he said that although the organic nitrogen is twice the price of the synthetic, "the difference in results you can obtain is so great price becomes secondary." However, the organic type may be obtained for nothing from residue materials.

Now, I have tried to give you some material. Much more is available but I do not want to write a book. However, there is sufficient material here to rest my case with confidence that I have shown a need for further study. Your professor is bound to be impressed with this evidence. If you can bring her over to do a little checking of her own what a victory that would be! Now it is up to you.

RADICAL CHANGE IN ORGANIC METHOD

By J. I. RODALE

THE tempo of modern civilization is *change, movement, fluidity, evolution, refinement.* The moment the first new car of the year comes off the assembly line, the designers are already half way through with next year's model with its changes, improvements and refinements. Two and two are four. That will never change, in spite of Einstein's theory of relativity, or the arguments of the chemical fertilizer theory proponents.

There are certain other basic conceptions which will never change; for example, the idea that organic matter is better than the concentrated chemi-

cal fertilizers as a food for the soil. But within the basic conception there will be and must be changes and improvements. Everything must have a beginning. Sir Albert Howard inaugurated the idea. He gave us the foundation of the organic method. The framework of his idea can never change. Organic matter is necessary for healthy crops and for healthy people and animals. Sir Albert Howard violently tilted with the chemical dragons and their "devil's dusts". We will never stop attacking the chemical fertilizer industry until it mends its ways, until it takes the sting out of the powders, which we know can be done.

With this as an introduction, and with the thought in mind that we can never fully repay Sir Albert Howard for the invention of his fundamental and far-reaching organic concept, let us see what changes it is necessary now to make.

In the November issue of the *Organic Farmer* I wrote six pages outlining this revolution in the organic method. In the field of farming this modification is more important than in gardening, because the labor of applying the method is so greatly reduced in the new method. The change I am speaking of has to do with the practical elimination of making compost.

The introduction of the organic method into the United States may be likened to a war. The first battle is over. The *Organic Gardening* subscriber list has just reached 100,000 names. Don't think that this was not a hard-fought battle. It took a lot of money. But we have reached our first objective. We have received recognition in some powerful quarters. There is not a county or even a city in the United States in which there are not some practicing organiculturists. We number millionaire magnates, congressmen, senators, judges, physicians by the many hundreds, educators, and even plain people, the ones who are taking this idea on their shoulders and carrying its torch, among the soldiers in the camp of organiculture.

Recently we laid the strategy for the second battle in this war, the organization of the *ORGANIC FARMER* magazine. This is going to be an important battle because by going out and fighting for farmers to join our movement we are going to educate the food-producing group to grow healthy crops fit for our first gardening group to eat. Gardening is one thing—it is important, but we are aiming at higher stakes. In our time we want to see a goodly segment of those engaged in agriculture wean themselves away from the chemical methods. We want to make a substantial dent in this rotten citadel of artificial farming methods, before it totally destroys the resistance of our bodies to the ravages of the degenerative diseases.

Now, how are we going to win this second battle? What is the goal of this battle? To draw as many farmers as possible into our camp. In the little skirmishes of this second phase of the war there were little engagements here and there in the last few years. We gathered into our camp a few thousand farmers who began to make compost. They were the hardy pioneers of the organic method, inspired men of the soil who loved the land and who were at the same time health-conscious. In some of these preliminary encounters we were defeated. The farmers said, "This method is back-breaking work. You don't expect me to make compost heaps? Show me a simpler method and I will be glad to follow the organic way."

Now we have the method to show him and strange to say it is not a compromise. In my opinion it is actually better than the old one. What is the new method? Instead of making compost we take the same material that we would have used in making it and use it directly on or in the soil. It is more or less a mulch method. The following two articles will give the full details. We do not mean that compost-making is to be eliminated entirely. There will be special situations that will require it, as will be seen.

A Christmas Centerpiece

This distinctive silver and green arrangement with white accessories lends holiday gaiety to the home.

—Mrs. Lloyd J. Hersh, Allentown, Pa.

How to Apply the New Organic Method in the Garden

By J. I. RODALE

WHEN we decided to make the change in the organic method it was about the beginning of September. The activity in the vegetable garden was dying down. Large parts of it were already bare. In all these empty places we laid down a heavy mulch about one foot thick consisting of a mixture of the following:

Corn cobs (ground)	200 lbs.
Alfalfa hay	200 lbs.
Soy bean meal	20 lbs.
Oyster shell lime	20 lbs.
Phosphate rock	20 lbs.
Limestone	20 lbs.
Kelp	20 lbs.
Poultry manure	100 lbs.
Japanese Enzactivator	20 lbs.

We wet it in thoroughly because in the event of an arid period the green matter might burn more if too dry. If there are corn stalks, they should be cut up. About a month later I noticed how nice and wet it was under the mulch and the thousands of earthworms there. I feel more confident than ever that this is the right way. All the liquid essences that are oozing out of the material are staying under the mulch, right at the place where plants will grow, not at the site of a compost heap which is not used for gardening.

In farming, of course, the material used will be far less in volume and will be only a thin sheet, but in the garden, a person will be encouraged to pile in the organic matter heavier. The idea now is, I think, not to ever leave the surface of the ground bare, but to follow nature's method in the field and the forest, leaving a litter on the surface. The more fertile your soil the quicker should such a mulch decay, the bacteria and fungi taking part in the process of decomposition.

There seems to be a conflict between the work of Professor Dhar, and the generally accepted beliefs of agriculture regarding the effect of plowing down green matter. The general idea is that if green matter is plowed under, the bacteria and fungi, that take part in the breaking down process will consume much nitrogen and create a nitrogen deficiency which will reduce the yield of a crop planted soon after the plowing down of such material. The following year, the dead bodies of the soil organisms having enriched the earth, the benefit accrues that raises the yield.

Dhar claims that if a layer of green matter is disced or dug into the upper 3 or 4 inches of soil, the sun, through the process of photosynthesis, will fix nitrogen and there will be no deficiency. In our case as insurance we used a liberal amount of alfalfa hay and soy beans which are legumes rich in nitrogen. If the material is ground up and dug into the soil in late August and September it should be thoroughly decayed by April or May. Of course this would not apply to a foot-thick heavy mulch which is applied to the top of the ground.

Throughout the past five or six years, I have been receiving letters from mulchers who spoke glowingly of their results. Many of them made no compost, merely applying organic mulches, and the quality of their crops was extremely high. One advantage of the mulch method is that the earth is not cultivated to remove weeds. In cultivation the lateral roots near the surface are cut, which somewhat shocks the plant. It is certainly worthwhile to experiment with mulching.

In our case, since the mulch is so thick, we do not expect it to entirely decay by planting time. We could do one of two things then. We may disc in the remainder of the residues and plant in it, following the Faulkner, no-plowing method, or we may clean out rows in the material for planting,

Straw Mulching in Vegetable Garden Encourages Earthworms

leaving the residue there as a mulch, and add more mulch material as the plants grow. This also would be an application of the no-plow method. The system is in swaddling clothes. You and we will both experiment together to develop the refinements which are bound to come.

Special Advantage of New Method

After thinking about the new method for a few weeks the thought arose, why not use a special mixture of raw organic materials for each vegetable and flower bed? For example certain plants like an acid, others an alkaline condition. With potatoes, lime could be left out and sawdust used in the organic mixture as well as oak leaves. The same is true for such shrubs as rhododendrons and azaleas. Lilac bushes prefer a lot of lime. In applying the mulches these preferences could be carefully considered. We will publish in the January issue, a seminar listing acid and alkaline loving plants. Instead of a shot-gun method of compost we have here a more precision method.

In some publication by Dr. Ehrenfried Pfeiffer, I cannot recall the one, he states that it has been found that tomato plants grow exceptionally well when their own residues are used with them as a fertilizer. We are going to follow this principle in our stone vegetable garden (See Stone Mulching in the Garden—Rodale Press), because in this type of garden, the rows are now reserved for next year's planting. We know where each vegetable is to grow. We are now digging in radish tops where the radishes are to grow, beet tops where the beets are to grow, carrot tops for carrots, etc., etc., etc.

There are a few exceptions to this as a general practice, as in cabbage. Cabbage residues should not be used in preparing the soil for cabbages, as cabbages grown in such soil seem to give off worse odor than ordinarily.

The gardener might follow this method also in the ordinary garden, by putting in markers for next year's plantings. The same idea could be followed with flowers. Every plant has a different mineral make-up. By giving it its own residues, we are assuring a supply of the right minerals.

Five Sections of the Rodale Vegetable Rock Garden

However this theory must be thoroughly tested.

Disease in Plants

The question will arise, by putting such plant residues right into the soil without composting, and if such residues are diseased, will we not be perpetuating the disease? According to the greatest authority, Dr. Selman A. Waksman, this should not be so. This point was covered in my answer to the medical student given elsewhere in this issue. The presence of a large supply of organic matter acts as a deterrent to disease organisms. As it is, the organiculturist is bothered with much less disease than those who use chemical fertilizers.

Some people will want to continue to make compost. There will be reason for that in many cases. With table garbage that will always be the best method, for we will not be wanting to strew garbage around the garden as a mulch. In this case the best way to handle it would be in a pit with a cement bottom. Start with about eight inches of top-soil to absorb the liquids. Over each day's supply of garbage cover with about half an inch of top-soil. Have a cover for the pit, so that rain will not enter. In about six months such material should compost. Place earthworms in this pit for better and quicker composting. We have always found that as such materials are accumulated, a sprinkling of old compost aids the decomposition processes.

Those who still wish to make compost heaps might consider doing it right in the vegetable garden, and rotating the site of the heap so that the garden itself will be enriched by the liquid essences coming from the

composting materials, rather than wasting them elsewhere. It is surprising how much nutrient-laden water trickles into the ground from the bottom of a heap, or from compost in an earth-floored pit.

In the Italian enclosed pit method the work has been with manure. We are now building an experimental pit to take only green-matter and to see how earthworms work in such a medium. We must understand that it is not a vacuum. Some air does come in, but it is in extremely limited quantities.

A variation of this method could be to eliminate the special drainage pit but to capture the water in a layer of about 7 or 8 inches of topsoil placed at the bottom of the pit, which is taken out and used. When new material is put in for composting, a new bottom layer of topsoil then is placed on the bottom. The top of the pit or heap could be covered with canvas to protect it from the rains. But a tight enclosure is the best.

Lawns

How can the new method, of not making compost be worked on lawns, since a mulch cannot be put on grass? One of the best treatments is to sprinkle bone meal, as well as peatmoss. The new Japanese enzactivator would be an ideal treatment. Ground up wheat, barley, soybean, oats or corn seed would also be excellent.

Earthworms

Those who have been breeding earthworms should by all means continue to do so. They may be placed under mulches and will materially reduce the time of its breakdown while enriching the soil with their castings. Another important thing, the compost made by earthworms in their breeding boxes does not have the disadvantage of losing liquids from below. They impregnate it to such an extent with their castings and bodily emanations that such compost will be found to be extremely valuable. Earthworm breeding must go on.

Earthworms Are Here to Stay

In an experiment which we made in the Selvi enclosed pit in which we inserted earthworms we found that they thrived wonderfully in it. The enclosed method is not a vacuum. There *is air,* but there is not a continuous movement or draft of air. The protected atmosphere of this pit seems to furnish an environment well relished by earthworms. I was amazed at the number of egg capsules they laid in this type of a pit.

Compost Made by Digesters

Compost made commerically by bacteria in digesters and in other ways is to be encouraged. Such processes sponsored by Mr. Joseph W. Frazer of the Kaiser-Frazer Company, Dr. G. H. Earp-Thomas and Dr. Ehrenfried Pfeiffer mean a great deal to the spread of the organic movement. In such compost there are no liquid losses, and the bacteria bring about a product of excellent biological value.

The general effect of doing away with compost heaps, or making compost only in enclosed pits has other advantages. It will eliminate complaints by neighbors. It will do away with the attraction of rats and other animals.

To the hundreds of visitors at our farm to whom we have been explaining these changes in the last few months, the general reaction has been splendid. Not one dissenting voice has been heard. They seem to feel that something is being done to keep abreast of the needs and demands of this field of endeavor that has no Government experimental station to father it or to watch over its growth.

It was very gratifying to receive a letter a few days ago from Mr. and Mrs. Darrell Boyle of 2016 Homesite Drive, Dayton, Ohio who visited our farm a few months ago and saw the Italian closed pit in operation. They called it the "airless" compost. They write, "We are already experimenting some on it and believe you have discovered something important. Our last heaps have been made 'airless' and

they're super. Never expect to see better compost."

Some of you may have remembered the article in Reader's Digest called "Lazyman's Orchard," where only mulches were used as a fertilizer and the fabulous results obtained. That is an application of the new method, too.

It is all in your hands, dear friends. Let us pull together now and see how much and how well we can put some of these ideas into practice. And of course, please keep us informed of your experiences.

Explanation of the New Organic Method

By J. I. RODALE

SIR Albert Howard, who died a few years ago, was the father and developer of the organic method of farming and gardening. He had a background of experience with it of over thirty years. He proved conclusively that it could give higher yields and healthier foods. I had the personal pleasure of introducing his method officially into the United States as his direct representative. We now have about seven years of experience with it. We and many others have found it good.

In the first place, the concentrated chemical fertilizers should never be used either in farming or gardening. Secondly, we greatly encourage the use of green manure or cover crops. But such green crops are not sufficient to fertilize the land, if crops are going to be taken off it each year. We must add something. If that is so, then what kind of fertilizers are we going to use?

We are told that growing plants need mainly nitrogen, phosphorus and potash, so we are going to review what our attitude is toward these three elements.

Nitrogen

Besides synthetic nitrogen, which we do not recommend, the only place you will find nitrogen is in the air and in living matter such as plants, manure, etc. If you plant a leguminous crop such as clover or alfalfa and plow it under, your land will become greatly enriched with nitrogen. By applying organic matter to the soil in the form of animal manure you will get some nitrogen. Another method would be to purchase organic materials that are rich in nitrogen such as cottonseed meal, castor pomace, slaughterhouse tankage, dried blood, etc. Our booklet (price 50c) called *Manual of Organic Materials* is helpful in describing the contents of various kinds of organic materials. Check with your regular fertilizer dealer for a supply of some of these materials. Otherwise, contact your county agent.

You can get additional nitrogen by applying mulches to your land, of weeds, leaves, grass clippings, spoiled hay, chaff, roadside trimmings, etc. They do not contain too much nitrogen but they have the effect, by decaying, of multiplying certain soil bacteria called azotobacter that can fix nitrogen from the air. In a soil well enriched with organic matter the population of azotobacter can become so great that the amounts of nitrogen they can fix becomes extremely significant.

Phosphorus

Instead of using superphosphate for our phosphorus we use the raw finely ground phosphate rock which is much cheaper and does not contain the harmful sulphur.

Potash

We advise going easy when it comes to potash because in excess potash can do harm. It creates an oversupply of cellulose and carbohydrate, and a reduction of protein. In France certain physicians inferred that the incidence of cancer and the amount of potash in the soil were related. Only in the last year or two have we become aware that safe types of potash can be purchased.

In chemical fertilizers the potash is put into action with muriatic acid, giving muriate of potash. It is the acid that we object to. Now, if we could find a source of safe potash, it would serve our purpose much better. And recently we have found two sources. One is a substance called *glauconite* used in water softening. Glauconite is a rock that has potash as one of its ingredients. By grinding it finely it becomes a safe source of potash for the growing crop. Some of it will be immediately available. Another source of potash is a rock called feldspar which, in a finely ground form, is used in the ceramic industry to make glazes. Both of these materials will soon be advertised in this magazine. This country has billions of tons of various kinds of rocks which if ground up would make wonderful, mild, safe fertilizers. The granite rocks usually contain some potash.

In many regions there are companies owning granite quarries that grind it to make grit for chickens. Check with them. Here you have a nearby source of ground rocks, many of which contain potash. You will not have to pay too much freight.

Thus far, therefore, in comparing the organic with the chemical method we see that we are not too far apart. We have phosphorus and potash at a lower price and nitrogen practically free of cost. Our type of phosphorus and potash can be spread with the same type of equipment as used by the chemical farmer. We also use green manure crops for additional organic matter.

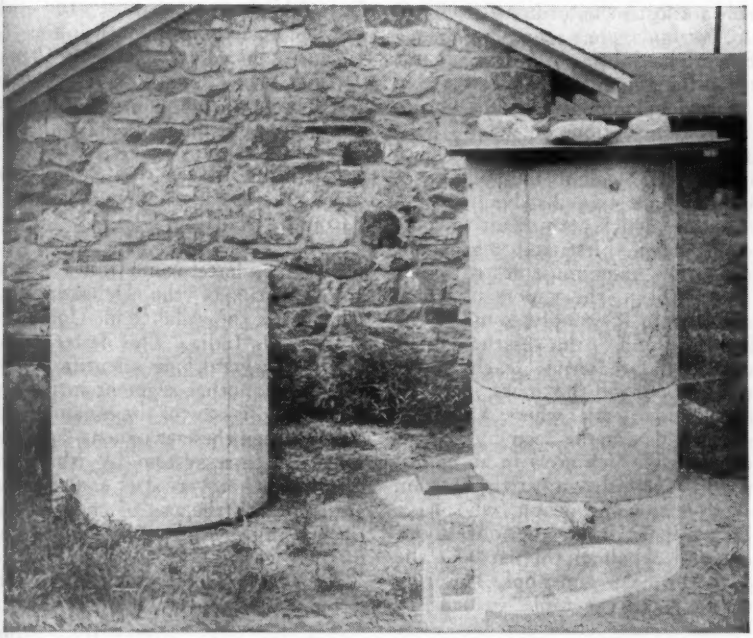
Do we *have* to make compost?

I can see where most farming can be conducted without making compost. The decision will be up to the individual. On small farms there may be a place for compost-making, but on larger acreage, probably not. We are now coming into the second phase of ORGANICULTURE, which appears to be a much cheaper method of farming. It will be characterized by higher crop yields, also containing higher quantity and quality of nutrients.

Now here are the facts which were instrumental in leading up to the second phase. About a year ago Mr. Charles Selvi, who was an agricultural inspector for the Italian Government and who in that work made some interesting discoveries about composting manure, contacted me. As a result he worked for The Soil and Health Foundation for about two months. In Italy more than ten years ago he was instrumental in developing a new method for aging manure.

In the Valcanale region of Italy, a summer-resort and farming country, the city tourists complained of the noxious smells of the manure from the farms, which they claimed was spoiling their vacations. The Government detailed Mr. Selvi to go there and see what he could do about it. He suggested that instead of leaving the manure heaped up in piles it be placed in covered pits. After studying the matter carefully he learned a few tricks. He found that if the pit had a cement bottom slanted toward a smaller special drainage pit outside of the confines of the main pit, so that the liquids could drain off into it, a better fermentation would take place.

He found that if the main pit was covered with tight doors to keep the air out, a better fermentation would take place. In other words, Mr. Selvi's process was an anaerobic one, accom-



Left, compost being made by the "old method". Right, a compost silo designed by Mr. Selvi. Skeletonized drawing shows underground structure.

plished without air. It was also important to keep the rainwaters out. The finished, fermented manure was found to be a wonderful product with much higher quantities of nitrogen, phosphorus and potash than the manure piled up in heaps exposed to the air. When it was applied to the fields the results were amazing. The crops were much finer and heavier in yields.

Now we were taught that to make compost we must prevent putrefaction by permitting the composting materials to be open to the air. In fact we had to make aeration holes in the material with a crow-bar. We were told that if we did not do so, if there was a lack of air, the undesirable putrefactive anaerobic bacteria would take over and spoil the compost.

To check on Mr. Selvi's method, we constructed a special pit with a cement bottom leading to a little outside pit for the draining off of the liquids. (See photograph) We made sure to tightly cover the top so that no air could enter. Next to it we made a similar pit with an earth bottom and no cover. We filled both with steer manure. At the time of writing, almost two months after the two pits were filled, we were surprised to find that the manure in the Selvi enclosed silo smelled less than that in the pit open to the air. The observation was made by Dr. Ehrenfried Pfeiffer, Dr. Wm. H. Eyster and myself. This is amazing since all the published literature claims that under such conditions there would be putrefaction and smells. Instead we find an orderly process of decay. The thing that struck me was that from the very first day a large quantity of liquid began to drain off into the little drainage pit. These were valuable essences,

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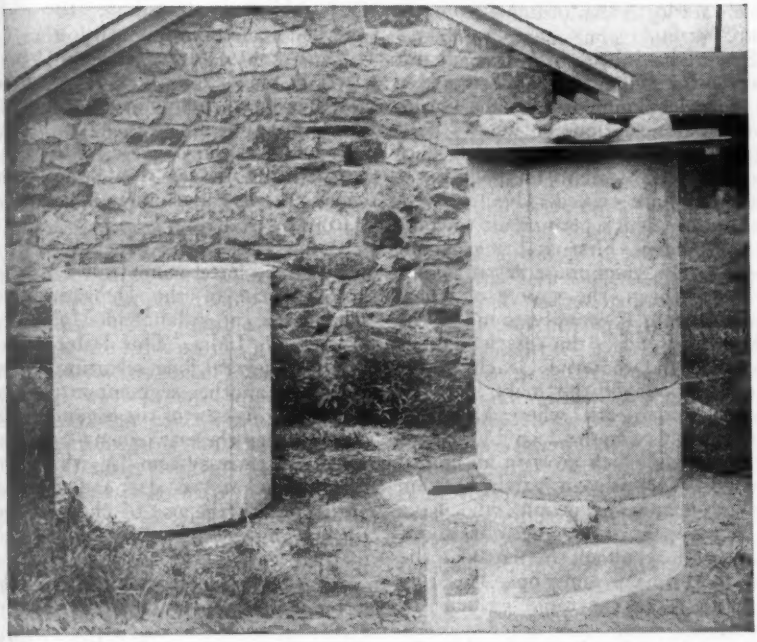

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which are lost in an ordinary compost heap.

Since I have been in on the organic method for a long time and have seen its slow development I would like to give my observations on what I have seen so far. It is my opinion that since studying the Italian method I see that there are two disadvantages in the method which permits air to come into the heap. First, it brings about an oxidation which must destroy some of the nitrogen, the vapors of which waste upward. Secondly, some of the valuable liquids, the essences, the juices of the materials leach downward and out of the mass into the ground underneath where they are wasted. This can be seen by the gigantic weeds which grow in an empty compost pit with an earth bottom. My suggestion to people who have made compost is to dig out about a foot and a half of the earth at the base of the heap and apply this rich earth to their vegetable gardens or to the new compost heap.

The Selvi method, by covering the top and the bottom, keeps everything in the mass. What is required now is a study of the chemistry and the microbiology of this new process so that we may become acquainted with the exact savings of plant nutrients. From what I have seen, I am thoroughly convinced that the new method is a great improvement over the old. One of its advantages is that there is very little heat generated and thus there is not a combusting out of weight or volume. The finished compost weighs much more, and takes up much more room, than an equivalent amount made by the present method.

Sheet Composting

Sir Albert Howard suggested two methods. One, the making of compost heaps. Two, sheet composting. I believe that the sheet composting method, combined with the Selvi process when conditions are such that sheet composting cannot be applied, will be the farming practice for the second phase of the Organic Method. Within a few months a booklet will be published describing the Selvi method in detail.

Since the start of *The Organic Farmer* magazine, a great responsibility has been put on our shoulders. Thousands of farmers have become interested in the Organic Method, but are waiting to see if a simpler and more practical method could be worked out.

A few weeks after Mr. Selvi left, as if by fate, a letter came from Dr. N. R. Dhar, Head of the Department of Chemistry, of Allahabad University, Allahabad, India. This letter, which included several long scientific papers, furnished another segment in the rapidly filling jig-saw of the organic method. Between these two men—Selvi and Dhar, I see a system by which any farm of whatever size can dispense entirely with the use of chemical fertilizers and operate under the organic method.

First let me give you a copy of the letter sent to me by Dr. N. R. Dhar:

24th June 1949

Dear Mr. Rodale,

I have read with great interest your book *Pay Dirt.*

For a number of years I have carried on research work on the problem of nitrogen fixation. I have shown that when energy materials like carbohydrates, fats, cellulose, glycerol, organic acids and their salts, are mixed with soil or sand, or oxides of aluminum, iron, etc., the energy materials undergo slow oxidation and in this process the nitrogen of the air is fixed. When this system is illuminated by sun light or artificial light more nitrogen is fixed. We have repeatedly observed that this phenomenon can take place under completely sterile conditions. We have been able to establish that in nitrogen fixation neither soil nor micro-organisms are needed. What is wanted is an energy material in contact with a surface to which air has access. This reaction can take place at the ordinary temperature, and I believe that this reaction is the chief source of the nitrogen in soil. As you are deeply interested in the problem

of the utilization of sun light I shall be grateful if you kindly take up some work on this important subject. It will be certainly worth while if workers in photosynthesis are also interested in this phenomenon in which sun light is actually utilized in increasing the nitrogen stock. I shall be obliged if you kindly try to get workers on photosynthesis interested in this problem so that they may take up experimental work in this line. I shall gladly supply details about the technique which is simple.

As you are keen on the preparation of composts I request you to use all types of waste energy materials for manure in your fields, i.e. add the organic matter direct to the soil, and allow the composting to take place in the fields as is actually taking place under natural conditions. The only point is that after the addition of the organic materials you have to wait for 2-3 months depending on the amount of the material added and then you can sow your crop. This time factor is needed because the phenomenon of the oxidation of carbon of the energy material takes time and thus in this time nitrogen fixation takes place. In composting the aim is to preserve the nitrogenous matter present in the organic substance and add it to the soil with 10 times its weight of carbon and the minerals. In my method you not only add the nitrogen present in the material but also add additional nitrogen which is fixed from the energy of the oxidation of the carbonaceous substance and light absorption.

In a separate cover I am sending you some of my published papers on the subject.

Yours sincerely,
(signed) N. R. Dhar

To say this is an exciting situation is to put it mildly. But if Dr. Dhar is right, and he seems to have done the experimental work to prove it, we seem to be on the threshold of something spectacular. The first phase of work, the foundation, was accomplished by Sir Albert Howard in India. Here is another phase which was done in that same country. Since Dr. Dhar is the head of an important department in the largest agricultural university in India, and since his papers, which have recently come in, give the results of highly scientific experiments, we must take advantage of this new technique. It was anticipated by Sir Albert Howard in his sheet composting process, which is what Dhar now suggests. By placing our organic matter in a thin layer in the field and discing it in the upper four inches there is a much slower oxidation than in the composting process, and in the field, says Dr. Dhar, more nitrogen is fixed. In the composting process we know that nitrogen is low, usually less than 1% of the total mass. In sheet composting it would be much higher.

As I see it, therefore, the organic method would now consist of applying ground up raw phosphate rock and potash rock as well as other types of rock which will be studied and developed. It would take in the growing of green manure crops and the use of sheet composting, that is, the application of manure and residues of green matter such as weeds, corn cobs, leaves, etc. directly to the field and letting it decay there rather than in a compost pile. When conditions are not quite right for sheet composting, the Selvi process could be used, that is, making compost in enclosed pits or silos with cement bottoms. The sheet composting process will save much labor. There will not be double handling. The liquid essences would stay on the field where they would be used. The organic matter should be disked in rather than allowed to remain on the soil as a top-dressing. In the latter case, the effect of a dry spell would be to burn out some organic matter.

It must be borne in mind, however, that to be a good organiculturist, the farmer must be on the lookout to find organic matter that originates outside of his farm. This is not as difficult as it seems, if the farmer has the will and

the enthusiasm. For example, nearby may be a cider-mill that sends hundreds of tons of apple pomace to the dump each year. The farmer could pick up a load of vegetable cuttings in town from a vegetable store every once in awhile, or egg-shells from a chick hatchery, leather dust from a shoe-factory, a cutting of weeds from a neighboring field owned by absentees who never farm it, obtaining permission of course, corn cobs given away free by mills, wood shavings from lumber mills, cannery wastes, water hyacinth from rivers in the south, sea-weed, spoiled milk from dairies, leaves from city streets. When you figure the saving in not buying chemical fertilizers it pays to spend some time and labor with a truck on the lookout for free organic material.

The Rodale Farm

To old followers of organiculture, what I have written may appear to be too drastic a change, but from an inside position in the organic farming movement many unusual experiences have come to my attention over the years that have contributed to the making of this decision. At this time there is no space to go into them, but there will be a continuous discussion of the whole question in these pages in future issues. I feel it is important to save people from spending money in building pits which will be obsolete before they are even used. One thing I *do* know—American farmers will not go back to the pitchfork. A method to be adopted on a wide scale must not be too difficult of application. Even if this new method were not quite as good, it still would attract farmers. But, I feel certain that the new mulch-compost-sheet method will be found to be an improvement. It won't take too long to find out.

On our farm, we are going to try to get away from making compost. We will work out some method of applying our organic matter right to the fields. In our steer barn we will follow the English fold-yard method which means that the manure is not taken out, but additional straw is thrown in every week or so, over the old manure. It is then cleaned out in the spring and is practically ready to go into a field where a crop is to be sown. We may construct a larger silo on the Selvi principle, or some other device, to store manure over the winter.

If Sir Albert Howard were here today I believe he would accept this change. When I introduced a change in his method by eliminating turning of the compost by introducing earthworms for that purpose, he applauded, writing glowing letters about the advance in the organic method, advocating the change in his publication, *The Soil and Health*. His own system was a change from the chemical method. It is to be expected that there will be further changes. Regardless whether they are made by me or others. If they are good, they will all contribute to the eventual death-knell of the chemical fertilizer concept. That was the prime motive of Sir Albert Howard.

We are now engaged in casting a bronze wall-plaque of Sir Albert Howard which will be a physical as well as a spiritual reminder to later generations of the inspired work of the founder of the organic farming movement. The more changes that are made, the more strength is given to the concept which he established. Sir Albert's favorite statement was that we must go from "strength to strength."

ENCLOSED MANURE PITS

By DR. CHARLES SELVI

An excerpt from "L'Agricoltura Friulana"
(The Agriculture of the Province of Fruili) 1934—*XII*

Sponsored by Traveling School of Agriculture for the Province of Udine

IN Italy's Valcanale District there are very few farmers who have not as yet complied with the regulations of a law that was passed to force a change of method on those backward agriculturists who persisted in keeping and treating manure in inefficient ways.

The problem of determining what method to use in that zone was complicated by the agglomeration of houses and stables found there, as well as by the nearness of numerous much-traveled roads and of many seasonal vacational resorts. These factors made it necessary to create a type of manure pit which could both comply with all the general legal requirements and also meet specific local demands. A solution was easily found by suitably modifying the three dimensions (length and width of the pit and height of the little surrounding wall) in such a way as to permit installation of a wooden cover over the manure pile, arranged obliquely to prevent rainwater from penetrating inside. So many of these closed manure pits (or box-type pits, as they might be called) were built that today it is not at all unusual to find localities such as Santa Caterina, Bagni de Lusnizza, and Valbruna, in which all the previously existing manure pits, whether efficient or inefficient, have now completely disappeared.

Up to this point there is nothing extraordinary in all this. However, in the course of time observant local farmers began to notice that the fields and pastures fertilized with manure from these enclosed pits were showing an exceptionally high degree of fertility in comparison to their productivity during former years. This improvement was promptly ascribed to the new treatment of the manure, for in the very first years of its introduction the farmers were greatly surprised by the uniformly rich softness and black color of the manure, and in particular by a characteristic condition of persisting humidity in the top layers, even though the pile had never even been sprinkled with liquid manure. Consequently, it should be instructive to explain the fermentative processes that take place in manure left to ferment in a pit of the open type, as compared with those occurring in a pit of the closed type.

A Few Technical Notes on Manure Fermentation

It is generally known that a watertight floor, equipped with a surrounding low wall, a drainage channel, and a small concrete cistern, can considerably reduce loss of phosphorus, potassium, and those parts of nitrogen and organic substances that would otherwise be dissipated by washing out and by infiltration. But what are the causes which result in their loss, when it is not directly attributable to absence of the above-mentioned equipment? Those causes bring us to the physical, chemical, and biological study of manure fermentation, a field in which present-day knowledge is still somewhat incomplete.

It is undoubtedly true that a manure pile, in the course of time, is bound to be subject to either combustion or humification: these processes almost never take place separately, but follow the various stages of their individual and mutual development. Manure combustion means oxidation of the organic substances and consequent production of carbon dioxide; humification involves meth-

anic fermentation along with production of methane and carbon dioxide. The first occurs in contact with air; the second, when out of contact with air. Which process do we prefer?

In this connection, it is necessary to consider the results of the very important experiments that were carried out many decades ago by the famous chemist Dehèrain. In one case of imperfectly anaerobic (i.e., not in contact with air) fermentation of manure he found a loss of 19.2% of the original nitrogen; in aerobic (i.e., in contact with air) fermentation this loss came out about double, 38.2%. But perfect anaerobic fermentation *showed no nitrogen losses whatsoever.*

The present status of our knowledge in this field is sufficient to interpret the above results. Nitrogen tends to become dissipated in the following forms: elementary nitrogen and ammoniacal nitrogen. Urine contains nitrogen in amide form (urea, uric acid, and hippuric acid), while solid manures hold it in proteid form. Alterable as all amides are, urea, which represents the nitrogen combination diffused in urine, decomposes rapidly, due to the action of an enzyme secreted by a micro-organism (*micrococcus ureae*). This gives rise to the formation of ammonium carbonate by a process of hydrolysis. A transformation which is unaffected by changes in the conditions of aero- or anaerobiosis, it takes place very rapidly and is therefore the first to appear among the fermentation processes which occur in manure.

As a result of the formation of this ammonium carbonate, urines, which are acids when just emitted, immediately undergo an alkaline reaction, which reaction also takes place in solid manures coming into contact with them. The reason is that ammonium carbonate, being an unsteady compound, tends to disintegrate readily into carbon dioxide and ammonium. If collecting cisterns are kept closed, the air above the liquid quickly becomes saturated with carbonic acid, which hinders any further disintegration. And vice-versa, solid manures and litters undergo much slower fermentations and are much more prone to take an abnormal direction, to the prejudice of all our principles of good economy. Is there anyone who does not at this point think of making periodic waterings, or compressing, or placing in layers? All these treatments are undoubtedly good, but they are also insufficient to reduce the inevitable and still considerable losses of nitrogen.

Sprinklings with urine, or strainings, are made for the following purposes:

1—to prevent acidification of the manure (the production of acids is continuous, due to the decomposition of the organic substances, especially when oxidating processes are prevailing);

2—to expel the air;

3—to promote the life of useful bacterial flora;

4—to prevent concentration of ammonium carbonate and of ammoniacal solutions in general;

5—to prevent denitrification.

In mentioning these five points, we also touched upon the outstanding factors of the multiple derivative processes which most usually occur in the solid parts of manure. As is generally known, the consequences of acidification are extremely disastrous. Molds (hyphomycetes) rapidly prevail over the useful bacterial flora (the vital activities of which are limited to the middle reaction), increasing and stimulating the degree of acidity to such an extent as to be really harmful to the soil and its produce.

The purpose of expelling the air is to prevent or reduce oxidation (combustion). Combustion of nitrogenous substances is always accompanied by the production of a great quantity of elementary nitrogen. Humidity in the pit environment represents one of the essential conditions for the life of bacteria in general, and of useful bacteria in particular. Ammoniacal exhalations, present in limited amount in diluted solutions which usually absorb the manure, increase gradually as fast as these liquids become concentrated because of drying out. Deni-

trifying bacteria, which exert their greatest activity in the airless and alkaline stages of the medium, are easily overwhelmed by the useful bacterial flora, when the latter find conditions satisfactory for maintenance of their superiority, provided not too great amounts of nitrates have previously accumulated.

Periodic sprinklings are of relatively limited efficacy, because of the very fact that they are made only at intervals. The same applies to disposing in layers, which should always be done with clayey soil, thus reducing nitrogen loss, since clay has the property of fixing ammonia. The purpose of compression is to eliminate more and more air, while retaining the liquid part on the surface by increasing the degree of capillarity in the manure.

It is needless to say that the various derived processes or treatments of manure, besides affecting the nitrogen content, also influence directly the contents of the organic substances, decreasing their richness and altering their reaction.

Utility of Enclosed Manure Pits

From the facts set forth above, it appears that the satisfactory course of the fermentation processes in manure is closely related to the complete exclusion of air, in addition to being strongly affected by the humidity of the pit environment. Enclosed manure piles fulfill completely all these fundamental requirements. The gaseous products, carbon dioxide and methane, drive the air from the pit, to which it is given chance to return only during the short times when periodic additions of fresh manure are made. This periodic and momentary aeration operates to the benefit of a purely chemical oxidation of the ammonia, with the consequent production of nitric acid, which in an alkaline ambient easily becomes transformed into soluble alkaline nitrates. Oxidation of the ammonia, only if biological, may be accompanied by denitrification processes (continuous specific action).

As can be noted from the data yielded by chemical analysis, the superior value per unit of the nitrogen contained in manure which is matured in enclosed piles, in comparison with that left in the open, is due to precisely this fact. In regard to the other two conditions (alkalinity and humidity), both are equally prevalent in the enclosed fermentation pits of the Valcanale district. Because of a more intense capillarity, which is due to the presence of a special rich and plastic consistency in the fertilizer, a great part of the liquid is constantly retained in a slightly alkaline state and tends to come out on the surface.

The chemical analysis recently carried out by the Experimental Chemical-Agricultural Station of Udine on a sample of fertilizer fermented in an enclosed pit has shown the following results:

Organic nitrogen	4.32 per 1000 parts
Ammoniacal nitrogen	1.14 per 1000 parts (free 0.90; salified 0.24)
Nitric nitrogen	0.21 per 1000 parts
Total Nitrogen	5.67 per 1000 parts

In a following paragraph we will mention the points to be borne in mind for a fair interpretation and appreciation of the relative richness of matured manure. However, from this point on we can already realize the support and approval which the outcome of this analysis confers on our statements.

Constructive Details

The most essential requirements for enclosed manure pits, that is, those making it possible to obtain a satisfactory, economical, and practical enclosure, deserve some special study. In the Valcanale district many systems of enclosure were tried out, starting with the simplest (made up of a certain number of wooden planks set in contact one with the other) and ending with real covered enclosures.

The structure made of separate planks, while costing less than any other, has serious defects, the principal one being that it does not make a

tight enclosure against damage arising from severe weather conditions. It is also not very practical to use during loading and unloading of manure, and is therefore inadvisable in respect to cleanliness and hygiene. Furthermore, due to inevitable oversight, the farmer often forgets to replace the planks which are necessary to remove from time to time.

Enclosures built with planks that are fastened together have proven much more satisfactory. In this way a practically perfect enclosure is obtained, and along with it, a more complete opening. The latter represents, incidentally, a very great advantage, because of the facility with which it enables the farmer to undertake various operations involved, but even more so because it enables him to distribute the manure inside the enclosure in a uniform and efficient manner. This means satisfying one of the most important requirements to have the manure ferment properly. Thanks to a proper and intelligent distribution of the various contents, it is possible to determine the respective degree of their maturing, at any moment and with sufficient accuracy. The advantage thus derived in preparing the manure will be obvious.

However, the problem of its practical and complete application (taking into account the weight of the cover) still remained unsolved for some time, since side-opening covers adopted up to now soon proved impractical, being too heavy to lift every day and reducing necessarily the opening space required for a perfect distribution of the manure. This problem was solved by using counter-balanced covers, of which various types have been built, including those with counter-weights and those with sliding covers. The last type is preferable to the counter-weighted one only if it is desired to use a high wall already existing, or else if sufficient space is not available for the swing of the counter-weighted arm (which, in any case, is much shorter than that of the related cover). It is hardly necessary to mention that especially in mountainous country, wood is always the most suitable material for such installations.

In fact, contrary to some assumptions on this point, wood boards, if properly arranged for the purpose in view, can resist perfectly the worst weather, and this without using the well-known systems of impregnation (carbolineum) or coating methods (tarred cardboard). This explains clearly why two counter-weighted covers built four years ago for Mr. Tomaso Karnell of Bagni di Lusnizza are still in perfect working order today and seem likely to last indefinitely. At present, manure pits which close by means of turning or rolling doors are being experimented with, though these are, of course, more costly.

As additional bits of advice, the little surrounding wall of the manure pit should be twice as thick at the rear as at the sides and front, in order to give better support to the weight (and counter-weights) of the covers. Care must also be taken to set the nails and hinges in the front and back before the concrete hardens. Similarly, it will be necessary for the counter-weights to exceed the weight of the respective covers somewhat, so that the pit will open automatically as soon as the cover is released, the latter being fastened by some hook or other type of closing device.

In conclusion, we would merely add that the manure pit should be slightly below ground level, so as to facilitate further the operations of loading and unloading. We advise definitely against the system of *permanently* covered manure pits, which, besides being costly, are not free from serious defects: the manure is such permanently covered pits tends to dry out excessively, and when this is not prevented by suitable precautions, the drying out of the the mass results in an abnormal development of all of the fermentation processes.

What are the Savings Obtained by Keeping Manure in Enclosed Manure Pits?

Manure has never been given the importance which it deserves: this is

in fact the case with all things which, being usually available, are not appreciated at their true worth. A few figures will easily convince the most incredulous persons of the immense economic advantages obtained by using methods of keeping manure in enclosed pits.

Animal excrement, immediately after being produced, contains an average of 0.45% of nitrogen, 0.25% of phosphoric anhydride, and 0.50% of potassium. That same excrement, upon being subjected to chemical analysis after normal maturing in a properly-built open manure pit (that is, one with open bottom and water-tight construction) shows 0.50% nitrogen, 0.30% phosphoric anhydride, and 0.55% potassium.

Although not perceptible at first sight, losses have really taken place. In fact, fresh manure kept in the conditions explained falls to half its volume, and, what is more important for our purpose, to two-thirds of its original weight. The reduction in volume is mainly due to the gradual condensation, that in weight is principally the result of the processes of active decomposition, accompanied by the formation of carbon dioxide and methane.

The result is that manure, when matured, weighs relatively more (to be exact, 3 to 4 tenths more) per volume than when it was fresh. A cubic foot of fresh manure weighs 32.0 pounds on the average; under the most favorable economical conditions of maturing obtainable with an efficient open-type pit, it will weigh from 41.7 to 45 pounds when mature. This means that if no loss had taken place during its maturing (the units of loss of weight remaining unchanged), there should be 0.68% of nitrogen remaining and not 0.50%.

Foregoing any discussion of the dissipation of phosphorus and potassium, we can conclude that manure kept in efficient conditions in an open pit loses 40% of the nitrogen originally contained. This loss is relatively small in comparison with the 80% or 90% we would have as a result of improper ways of keeping, but it is also relatively large in contrast to the 10%, 5%, and even 2% obtainable with the use of closed pits. In them the fermentation takes place out of contact with air, and the reduction in weight, when matured, is one-quarter that of the original weight. To know the exact loss in the manure used for study by the Chemical-Agricultural Station of Udine, we need only make the following calculations:

> Nitrogen content, 0.567%. Reduction in weight against initial weight, one-quarter. Original nitrogen content, 0.45%. The same content, assuming that no loss other than in weight has been suffered, 0.60%. Difference, 0.033%. Consequently, if the loss amounts to 3.3 for 45 parts of nitrogen, the percentage relative loss comes out at 7 units.

These are the data as referred to units of measurement. Let us now develop them further. We can calculate that each head of cattle weighing 1100 lbs. produces 33,000 lbs. of fresh manure per year. The nitrogen content of that amount will be 147.5 lbs. as per the data given. The comparative amounts of nitrogen lost, depending on the method of keeping, will thus be as follows:

1, 176 lbs. with inefficient methods.
2, 59.4 lbs. with open manure pit.
3, 6.6 lbs. with enclosed pit.

The average prices of chemical fertilizers used today are:

a 1 lb. of nitrogen, 12c
a 1 lb. of ammonium sulfate, 10.2c.
a 1 lb. of sodium nitrate, 14.3c.
a 1 lb. of phosphate, 3.54c.
a 1 lb. of potassium (potassic salt), 3.82c

However, comparisons on those costs would make an unsatisfactory interpretation of the physiologically useful and practical value of the food elements contained in the manure, if we dared compare them directly with the respective value of the nitrogen, phosphorus, and potassium in chemical fertilizers. Neglecting the phosphorus and even the potassium, the comparison can never overlook the fact that

common ripened manure contains almost all its nitrogen in the organic state, and therefore this can never in any way have the value nor the price of that of ammonium sulphate or of sodium nitrate.

These comments should make it clear that a greater value per unit must be ascribed to the nitrogen contained in manure matured in closed receptacles, ammoniated and nitrified considerably, as compared with the nitrogen in common nitrogen. However, if we wish to carry out our calculations successfully, we can use the above unit price for both the fresh manure and the common matured manure, experimentally of course and bearing in mind that the effective value of the organic substance contained in the said manures can be referred to, to fill any gaps. Consequently, the results are as follows:

Value of the nitrogen contained in 33,000 lbs. of fresh manure, $17.62.

Loss:

1, with unsatisfactory systems of keeping, $15.76.
2, with open type of manure pit, $7.57.
3, with enclosed pit, $.79.

Against this $.79 loss, we must now oppose the greater value that the manure has gained by virtue of the ammonization and nitrification as a base of reference, and estimating at at least 20% increase this surplus value gained by manure matured in an enclosed pit, we obtain the following final figures: whereas poor systems of keeping manure entail a loss of $21.04, and the efficient open type of pit causes a loss of $7.10, instead of a loss we obtain a profit estimated at $3.37 per year by using the enclosed manure pit.

Estimated Cost of Building an Enclosed Manure Pit in Ordinary Concrete and Reinforced Concrete for Three Large Head of Cattle

Referring to the advantages of the enclosed manure pits, especially in mountain regions, we give below the estimated cost for building an enclosed manure pit, in ordinary concrete, and reinforced concrete, for three large head of cattle, in the Valcanale district.

1—Excavation in ground for average density:

a) for the pit: 14.30' x 11.05' x 3.91' : 618 cu. ft.
b) for the small pit: 5.20' x 4.39' x 7.30' : 178 cu. ft.
Altogether: 796 cu. ft. at 0.767c : $6.11.

2—Paving of the ground at the bottom of the pit and small pit by a layer of stones of .49 ft. diameter, placed one next to the other, including cartage of the stones from an average distance of 1625 ft.

a) for the pit: 14.3' x 11.1' : 158 sq. ft.
b) for the small pit: 23.2 sq. ft.
Altogether: 181.2 sq. ft. at 4.98c : $9.04.

3—Bottom, with 3.94 in. thickness:

a) of the pit, in concrete mortar, with 12.8 lbs. of cement for each cubic foot of filling material, including formation of the surrounding channel (2% grade), small ditches and discharge hole:
14.3' x 11.05' : 158.2 sq. ft. at 4.98c : $7.90
b) of the small pit in concrete mortar, with 11.5 lbs. of cement for each cubic foot of filling material:
6.50' x 4.39' : 28.5 sq. ft. at 2.99c : $.85
Altogether: $8.75

4—Walls in concrete mortar with 11.5 lbs. of cement for each cubic foot of filliing material containing gravel and sand, including the above cartage, reinforcing and later removal of reinforcing:

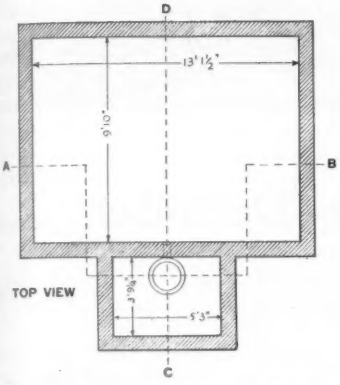
a) of the pit:
2 x 14.30' x 5.53' x 0.65' : 102.8 cu. ft.
2 x 9.75' x 5.53' 0.65' : 70.1 cu. ft.
b) of the small pit or hole:
6.5' x 2.60' x 0.65' : 11.0 cu. ft.
2 x 3.74' x 2.60' x 0.65' : 12.6 cu. ft.
Altogether:
196.5 cu. ft. at 10.74c : $21.10.

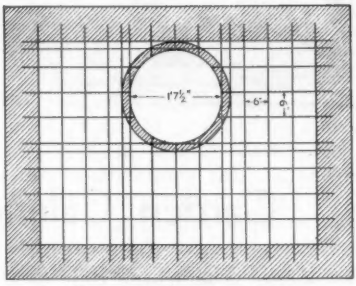
5—Inside plastering with thin cement, smoothed with the trowel:

a) bottom and walls of the pit:
13.0' x 9.75' : 127 sq. ft.
2 x 13.0' x 5.52' : 143.5 sq. ft.
2 x 9.75' x 5.52' : 107.8 sq. ft.

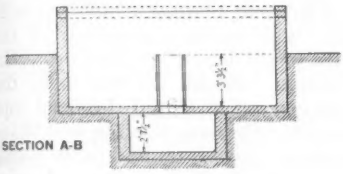
Top View Plan, Upper left Drawing

b) bottom and walls of the small pit:
5.20' x 3.74' : 19.5 sq. ft.
5.20' x 2.60' : 13.5 sq. ft.
2 x 3.74' x 2.60' : 19.5 sq. ft.
Altogether:
430.8 sq. ft. at 0.15c : $6.44.

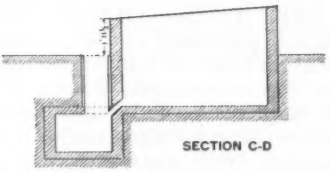




TOP VIEW OF DRAINAGE PIT SHOWING SCREENING



SECTION A-B



SECTION C-D

6—Cover strip for the small pit, thickness 3.94 in., reinforced with 14 iron bars of 0.32 in. diameter, 11.4 feet long, made of concrete mortar with 16.0 lbs. of cement for each cu. foot of gravel and sand filling material, including the reinforcing, forming and removal of reinforcing.

Section A-B—Lower left drawing

Also including, finally, the above-mentioned plastering with thin cement: 6.84' x 5.37' : 36.70 sq. ft. at 17.4c : $6.40

7—Cylinder in cement, of 1.64 ft. diameter, 3.25 ft. length and 1.38 in. thickness, including wooden cover: $1.32.

8—Two covers in hard wood, made up of:

a) 24 boards of 1.04 in. thickness, 11.05 ft. length, 0.65 ft. width, calculated at 38.4c per cu. ft. : $5.26.

Section C-D—Lower right drawing

b) Two Z-shaped reinforcements, fastened at the under side of the cover: 52.6c.

c) Labor for fastening, including nails and hooks: $1.05.

Altogether: $6.84.

Cost of the manure pit, Total: $58.10.

Upper right drawing

Soletta.....Cover Strip of the small pit, showing arrangement of the iron bars.

Such is the cost with the explicit values, in all the details. In other words, it represents the estimated cost, if the farmer hires a contractor to do everything.

However, this is not at all necessary, as the farmer himself can transport the stones, gravel, sand and wood, and therefore need only pay for the iron bars, cement, the cylinder to be placed above the small pit, and perhaps for the covers.

In that case, he would spend:

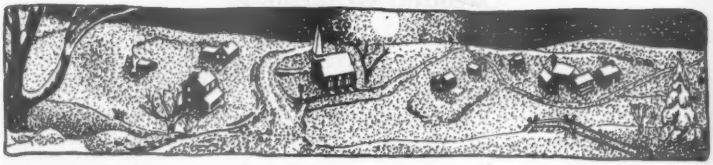
1—3,300 lbs. of cement at .371c (this being the present sales price for small lots at the "Cementi del Friuli" Plant): $12.22.

2—14 iron bars of the size mentioned at 5.26c (at hardware stores in Udine): 73.7c.

3—Cylinder for the small pit: 1 - $1.21.

4—2 covers in wood, including reinforcements, nails and hooks: $5.79.

Or in total: $19.96.



Garden Calendar—December

December is mulching time in the garden. Unless it has already been done, clean all plant residues from the gardens and remove them to the compost heap, or shred them and return them to the soil as a winter mulch. One can do no better than imitate Nature in the woodlands where the leaves have fallen and are layered on the ground over the roots of shrubs and trees and tender herbs. This natural mulch becomes a thermal blanket which not only protects soil organisms but also feeds them. The herbaceous plants of the woods have withdrawn completely into the leafy mulch and are thus protected from sudden temperature changes in the winter months. In the fields the herbaceous plants have also died down to the ground level and the dead tops of the plants form a natural mulch to prevent the alternate freezing and thawing of the soil during the changing temperatures of the winter and early spring months. Over Canada and the northern parts of the United States Nature gently spreads a layer of snow which serves as a most efficient mulch during the coldest parts of the winter. In our gardens we can do no better than imitate nature in using mulches. Especially suitable for this purpose are peat moss, ground leaves, and other plant materials, sawdust, salt hay, straw, and other plant materials which are free from weed seeds. Some plants must have a light airy mulch, as for instance, strawberries, chrysanthemums, and delphiniums.

THE NORTH

Flower Garden. If the ground is not frozen bulbs of lilies and of the wild species of tulips may still be planted. Cut off all dead plant tops of chrysanthemums, foxglove, hollyhocks, and other herbaceous plants and use them for mulching. Plants which must have a mulch which will not pack down are chrysanthemum, foxglove, delphinium, hollyhock, iris, coreopsis, daisy, pinks, primroses. Net your tree peonies and tree roses with wire and cover them with leaves for the winter. Tree roses and climbing roses may be layered underground for the winter. Prepare your excess flower seeds, collected from your own garden during the summer and autumn, for Christmas gifts by putting them up in neat and colorful seed packets. Your friends will appreciate choice seeds more than almost anything else you might give them. Such seeds grow into plants which represent a remembrance that lasts through the following year.

Vegetable Garden. Sanitation is worth practicing in the vegetable garden. Remember many insect pests spend the winter in and under plant residues. Clean off the vegetable garden and mulch it with finely ground autumnal leaves or residues from the flower garden. Or the vegetable garden may be seeded in winter rye or hairy vetch as a winter cover crop. Far more attractive is a neat, orderly garden seeded with a cover crop than one having half frozen vegetables of various kinds lying about in a disorderly fashion. Many of the garden insects hibernate in these dead vegetable remains. Why allow this to happen in your garden?

Shrubs and Trees. Shrubs and trees may be pruned safely so long as the branches are not frozen. Plants that should be pruned at this time are climbing rose, honeysuckle, lilac, and mock orange. Tender shrubs as boxwoods and daphne should be protected by erecting a light wooden frame to be covered later with burlap to screen off the biting winter winds. Evergreens that need trimming (most of them should never be pruned) should be trimmed about two weeks before Christmas, and the trimmings should be saved for Christmas decorations. These trimmings should be kept in a cool, dark place and sprinkled occasionally with water. By this conditioning process, the leaves and fruits will remain on the evergreen branches longer than if they are taken directly from the tree at Christmas time. Fruit trees should be protected from rabbits and field mice by removing all plant materials from the space around the trunk and replacing them with sharp cinders. Also around the trunk should be placed a cylinder of wire to prevent mice and rabbits from chewing the bark from the tree trunk. The old canes of raspberries and blackberries should be cut out if this has not already been done. A surface mulch of pulverized plant materials is beneficial to the berries. Newly planted trees should be anchored against winter winds. After the ground is frozen, all trees will be benefited by a suitable mulch. Conifers and such broad-leaved evergreens as azaleas and rhododendrons should be watered freely and mulched just before the ground freezes up for the winter.

Mulching. Mulching has already been emphasized as the garden theme for December. Strawberry beds, perennial beds, and all other plants not especially mentioned above should be mulched just as soon as the ground is frozen. This will prevent the alternate freezing and thawing of the ground which is so harmful to plants. In mulching strawberries and plants with prominent crowns above the surface of the ground, be sure to use plant materials which will not pack.

THE WEST COAST

The perennial border may be renewed by taking up the plants, separating them, and resetting them in freshly prepared soil. Among the perennials may be planted dwarf gladiolus for succession of bloom. Lilies may be planted in soil that has been lightened with sand and enriched with compost. At this time also Montbretia bulbs may be planted. A must in California gardens is Christmasberry (*Heteromeles arbutifolia*) to add Christmas cheer to the garden. Sweet peas should be planted now for spring bloom. It may be necessary to add trace elements to your soil to grow sweet peas successfully. Cacti are now dormant and should be watered seldom or not at all.

THE SOUTH

Flower Garden. Plant bulbs such as fritillaria and mariposa tulip. Prepare new flower borders by spading the soil and enriching it with compost and bone meal so that it will be ready for planting later.

Shrubs and Trees. Transplant all kinds of trees as oak, holly, ginkgo, and tulip tree. Shrubs which produce their flowers on the current season's growth may be pruned at this time. This also is the best time to transplant roses, hydrangeas, and oleanders. Various shrubs and vines may be propagated by layering during the winter months. Also cuttings may be made and placed in a trench out doors for rooting. By spring they will have rooted and may be planted out in rows in the garden or nursery. Azalea should be kept well watered during the winter.

Vegetable Garden. Set out asparagus, rhubarb, cabbage, and strawberry plants. This also is the time to plant seeds of many vegetables. Get copies of our Garden and Vegetable Calendars.

THE LOWER SOUTH *

Flower Garden. In December, when there is less rain than earlier in the year, the flowers will appreciate a mulch over the application of compost or other fertilizer. Azaleas need mostly a heavy mulch of oak leaves to do their best, as they are acid-loving plants. Varieties to plant this month are: ageratum, alyssum, arctotis, aster, baby's breath, bachelor's button, balsam, blue lace flower, calendula, calliopsis, candytuft, carnation, Chinese forget-me-not, Shasta daisy, dianthus, gaillardia, strawflower, hollyhock, larkspur, lupine, nasturtium, pansy, phlox, California poppy, petunia, Queen Ann's lace, salvia, scabiosa, snapdragon, sweet pea, statice, verbena, periwinkle.

Vegetable Garden. Most of the vegetables that have been planted during the past few months can still be planted. Plant beets, broccoli, Brussels sprouts, cabbage, Chinese cabbage, carrots, cauliflower, celery, collard, eggplant, endive, garlic, kale, kohl-rabi, leeks, lettuce, mustard, onion seed and sets, parsley, parsnips, garden peas, peppers, potatoes, radishes, romaine, rutabagas, spinach, Swiss chard, tomatoes, turnips. At times, where peas of the garden variety have never been planted, and the soil has not been inoculated, it is difficult to get them started. This is one crop that can be raised on the same section of the garden year after year, and after once a good crop has been raised, succeeding crops grow easily. Without special inoculation, they will grow readily if planted as follows: Dig a trench as long as wanted for a row, six inches or more deep, fill it nearly full with compost, care being taken that it is well ripened; add a mixture of compost and garden soil, half and half, and plant the peas in a furrow about two inches deep, covering them with the top mixture.

Trees and Shrubs. This, being the "dormant season", or what passes for a dormant season in Florida, is a good time to transplant citrus and other trees. Very young trees after being transplanted will be helped to withstand cold nights if the earth is heaped up around the trunks.

THE SOUTHWEST **

December is a planning and shopping month for Southwestern gardeners. Early planted material should be mulched and watered carefully until the copious winter rains occur. Composting can be continued throughout the winter season. All waste from your fall clean-up should be fully utilized. Bermuda lawn rakings make excellent compost. Our baked-out soils are gluttons for humus, and we should always remember that *humus* is the life of the soil.

Flowers. We can still continue planting well-developed hardy perennials and annuals from plant bands and flats. Many who failed to plant sweet peas earlier can now obtain them in plant bands and set them immediately into rows where they are to bloom. By so doing you can space them better and outwit the birds who nip them off as soon as they show out of the ground. Seasonable bulbs may be planted as long as good firm bulbs are obtainable. Avoid bargains which are dry, shrunken or soft and pulpy.

The last succession of potted bulbs may be put in the first week in December, especially daffodils and tulips. Get if possible, *Tulip Clausiana.* Hybrid amaryllis make showy and satisfactory winter and spring pot plants. If you have never tried cyclamen out of doors, get good strong plants which have not been forced in a green house, and use them under oak trees and other semi-shaded locations. We do not make enough of hardy ferns in our shade borders. Many species both dwarf and tall, are available for fall and winter planting. Use plenty of leaf mold and compost in planting. Well grown pots of ciner-

* Edwin H. Abrams, St. Cloud, Florida.

** Charlotte M. Hoak, 1125 Stratford Ave., So. Pasadena, California.

arias and primulas can be used as soon as the areas vacated by summer plantings have been cleared out.

Trees and Shrubs. As soon as the leaves are off the deciduous trees and shrubs give them their regular winter pruning. If you are a novice consult Sanford Martin's excellent pruning book written especially for Southwestern gardens. Prepare soil for the early January planting of bare-root roses and all deciduous material. Put in your orders early so as to get the first choice of the best stock. Potted and balled flowering trees do better than the average run of bare-root ones. Camellias may be planted and transplanted now, azaleas may be set out now, and many of the conifers and hardy evergreens profit by early winter planting. Shop around for living Christmas gifts for your gardening friends. Espaliered material is always acceptable. Put money into plants, not into tinsel and wrapping paper. Offered in the popular redwoods tubs is a wide variety of material, camellias, azaleas, berried shrubs, flowering quince, evergreen trees, Meyer lemons, and Chinese holly. These are a few of the gifts your gardening friends will welcome. Don't overlook the finest holly for our Southwestern gardens, Ilex Cornuta Burfordi without thorny leaves and full of berries. Encourage living Christmas trees. They will live in containers a number of years, and can finally be planted out. Lawson cypress, Incense cedar, and *Abies pinsapo* make good conifers for this purpose.

Vegetables. In spite of what seed catalog planting calendars say, December is not a good planting month for seeds in open rows or for quick growing plants. It is our dormant season. Prepare rows for asparagus, artichokes, and rhubarb, and set them out as soon as the dormant roots are available. Put in cover crops on all unused areas. Plant onions (seedlings and sets). Windsor beans, Chinese edible pod peas, and garden peas may still be planted. Garden herbs can be set out. Use oriental leaf garlic in your bulb bed, and chives divided and set now make excellent edgings. Where you have good light soil and full sun, radishes, Southern curled mustard, Chinese mustard, and chard can be planted. Cos and leaf lettuce plants can be set out.

The Soil and Health Foundation

The Foundation, which is a non-profit corporation, and exists on contributions received from the public is still in the process of equipping its laboratory. The following is a list of some of the equipment and its price recently added:

Equipment	
1 Distilling Apparatus for 110 vac. Kjeldahl	$275.00
1 Centrifuge	108.00
1 Distilling Bath for Evaporating 12 units	82.00
2 Ocular Micrometers for B. and L. microscope	30.00
4 100-cc. pipettes	3.88
Chemicals and Supplies	
25 grams A-phenylenediamine	.55
1 doz. litmus paper	.80
500 grams alpha-naphthylamine hydrochloride	5.50
1 pound Bacto-nutrient agar	8.28
1 pound propanol 2	.85
0.1 gram vitamin A	6.50
Diatase enzyme T-1	3.00
Anhydrous sodium sulphate	.60
Disodium sulphate crystals	.65
Butonal	1.15
2-6 Dichloro quinone chloramide	.70
Insurance	.25
24 Test tubes with screw caps	4.40
24 Durham test tubes	1.68
	533.79

As yet there is not sufficient money being taken in to hire a scientist to do experimental analyses. However, horticultural experimental work is being done on a limited basis. Part of the funds of the Foundation were used to pay Mr. Charles Selvi for about two months of work in connection with the Italian process of making "airless" compost.

NEW HORIZONS IN COMPOSTING

By WILLIAM H. EYSTER, Ph.D.

IN this issue of the *Organic Gardening* magazine Mr. J. I. Rodale has presented material which greatly extends the horizons of the composting process and the whole organic movement. The methods developed by Sir Albert Howard in India and introduced into the Western World are being extended and modified to fit conditions which prevail in practical gardening and farming in the United States. The heap and pit methods of making compost may be regarded as almost necessary in places where the land is so limited that food plants must be grown continuously, and where labor is either cheap or is willingly done by the gardener who feels well repaid by the increased quality and flavor of his foods and the more brilliant colors of his ornamental plants. In the United States where more land is available for growing things and labor is more expensive, new and more practical methods of organiculture must be found.

In the approximately two and one-half years that I have been associated with Mr. Rodale in the organic movement, I have witnessed the modifications and extensions in the making of compost which Mr. Rodale has just announced. Composting is an exceedingly complex series of fermentation processes brought about by a multitude of organisms which are native to the soil and to the organic residues which occur on the surface of the soil and eventually become a part of it. Organisms of decay take apart dead bodies of plants and animals in much the same way as wrecking crews dismantle a modern building or a great factory. Such structures, however, are very simple when compared even with the simplest type of living organism. Like specialized crews of men, some organisms break down carbohydrates, others in many relays decompose the proteins, and still others the fats. Hundreds of different kinds of organisms are involved, one type beginning where the other ends. This dismantling process continues until plant and animal residues are reduced to humus containing plant nutrients and other products. There are also building up processes on the part of some soil organisms which produce such important products as growth hormones and antibiotic substances.

In making compost we succeed best when we imitate nature's ways. There are so many variables as to kinds of organisms, temperatures at which each kind functions best, humidity, acidity and alkalinity, moisture, and available oxygen that much research must be done to find methods which will yield composts of the highest values, and in places where they do the most good. According to the new method described in this issue, the composting is done on or near the surface of the soil in the garden and field where all the decomposition products and synthesized materials drain into the soil in which plants are to be grown rather than into the soil under the heap or pit. This is in fact the method used by nature on the forest floor to convert the plant and animal residues of woodland and forest into leaf mold and humus.

The enclosed pit as devised by Dr. C. Selvi provides conditions of humidity and gaseous environment which are favorable to organisms which convert manures and green matter into a compost unusually high in plant nutrients. The closed pit retains the carbon dioxide which is given off from the fermenting compost. The carbon dioxide forms a gaseous blanket around the composting material

which excludes oxygen and favors the anaerobic organisms. The closed pit conserves moisture, creates a favorable humidity, regulates temperature, and excludes rain. The humid, carbon-dioxide-rich atmosphere in the pit also seems to favor the earthworms which are assuming greater and greater importance in the new methods. In the enclosed pit, manures and green matter can be converted into the very highest grades of compost. There is evidence that green matter and natural earth substances can be made into good compost with no manure other than that of the earthworms themselves. The compost is rich not only in N, P and K, but in all the essential nutrient elements and other substances so necessary for the vigorous growth of plants. Such plants are relatively free from insect pests and diseases because they are whole, i.e. free from all deficiencies. Whole plants insure wholeness or health in animals and man.

Composting is on the march. New horizons are opening up to us. The new methods mean that the organic method is practical on the farm however large. Complete natural fertilizers are becoming available and will be used.

Seminar on Acidity and Alkalinity

ACIDITY and alkalinity of soils is the result of (1) the chemical nature of the rock from which the soil is derived, and (2) the partial or complete decomposition of vegetation. Alkalinity, so far as the growth of plants is concerned, is confined to the rather limited areas of limestone, the salt marshes, and the alkali deserts of the West.

From a practical gardening standpoint all we need to do is to provide acid-tolerant plants with the degree of acidity in which they mostly grow. The acidity for garden and field plants is pretty well known. But the bog gardener, the wild-flower gardener, and the rock gardener need a method of testing soils to determine with reasonable accuracy whether the sites are suitable for the plants involved.

The term pH means hydrogen-ion activity. This activity is nearly as important as temperature in many biological and industrial processes. It is of such great importance in the vital processes of soil organisms and of higher plants that every gardener and farmer should have a clear understanding of pH.

Chemists have devised a scale for measuring the acidity and alkalinity of soils based upon their hydrogen ion concentration or pH value as it is called. It is based upon the known color reaction of certain pH values for certain chemical indicators. Using this method does not need any greater knowledge of what lies behind such tests than using a radio, for instance.

For practical purposes we may classify soils as follows: pH 4.0 as very acid; pH 5 as acid; pH 6.0 as slightly acid; pH 7.0 as neutral, i.e. neither acid nor alkaline; pH 8.0 as alkaline; and pH 9.0 as strongly alkaline.

Very Acid Soils (pH 4.0). Very acid soils occur in peat bogs covered with spagnum moss and in the duff under coniferous trees.

Acid Soils (pH 5.0). Acid soils include peaty upland soils, rotted wood, some pine-barren sands, and heavily fertilized but seldom limed fields and gardens. Some plant indicators of acid (pH 5.0) soil are dwarf or bunchberry

(*Cornus canadensis*), golden thread (*Coptis trifolia*), arbutus (*Epigaea*), mountain laurel (*Kalmia latifolia*), trillium, and mountain ash.

Slightly Acid Soils (pH 6.0). Slightly acid soils occur in most gardens in non-limestone regions, and in gardens in which manure or other organic matter are never used and seldom limed. Garden plants which prefer this type of soil are potato, watermelon, tobacco, and spinach.

Neutral Soil (pH 7.0). Neutral soils occur in ordinary gardens in which are used manures, organic matter of other types, and limed. Also most composts, rotted manures, and black leaf molds are neutral. In this soil most of our garden plants thrive.

Alkaline Soils (pH 8.0). Alkaline soils occur in salt marshes, limestone soils, and heavily limed soils. Plant indicators of alkaline soils are rough bedstraw (*Galium aparine*), oxeye daisy (*Chrysanthemum leucanthemum*), and *Trifolium medium.*

Soil pH in Relation to Micro-organisms.

The process of nitrification, i.e. the oxidation of ammonium salts to nitrites and nitrates occurs over a wide range from pH 3.5 to 11.9 with an optimum at pH 6.5 to 7.5.

Ammonification, i.e. the breaking down of proteins to ammonium compounds by *Bacillus mycoides* and other putrefactive bacteria occurs in the range pH 3.5 to 7.0 with very little action above 7.0. The optimum pH is 4.5 to 5.5.

The denitrifying bacteria, *Thiobacillus denitrificans,* shows an active range of pH 5.0 to 10.7 with an optimum at pH 7.0 to 9.0 but other bacteria have other ranges and optima.

Nitrogen fixing bacteria, *Azotobacter,* respond very markedly in changes in pH from 6.0 to 6.5; between 6.1 and 6.5 there is a rapid increase in action with increase of pH; from 6.5 to 7.8 there is maximal action with very little action above 7.8.

Clostridium pastorianum shows a range of soil pH from 5.0 to 7.5 with an optimum at pH 6.9 to 7.3. The symbiotic *Rhizobium radicicola* varies with the host plant from the lower limits of pH 3.2 in lupine, pH 3.4 in soybeans, pH 4.3 in clovers and beans, pH 4.8 in peas and vetches, pH 5.0 in sweet clover and alfalfa to the upper limits of pH 11.0 for lucerne.

Soil pH in Relation to Shrubs and Trees

Few shrubs and trees are acid tolerant. The most common are birches, oaks, alders, currants, bunchberry, mountain ash, and *Magnolia glauca.* Some are mesophilous (pH 4.8 to 7.2) and are intolerant of any degree of alkalinity, as rhododenrons, raspberry, azaleas, birches, oaks, hollies, elms, junipers, dogwood, pines, spruces, and hazlenut.

Acid tolerant are apple, cherry, plum, pear, elm, beech, box, species of maple, and most of our common ornamental shrubs and trees. While these shrubs can tolerate acids, they should be limed occasionally.

Soil pH and Lawn Grasses.

The best lawn grasses available for putting greens and bowling greens are brown top (*Agrostis tenuis*), Chewing's fescue (*Festuca rubra* var. *fallax*), and *Festuca ovina* var. *tenuifolia.* All three of these grasses form a turf best under definitely acid conditions, pH 5.2 to 5.6, which excludes some undesirable weeds and is attained by adding acid peat or composted oak leaves.

Soil pH and Pasture Grasses

Most of the grasses used for grazing and for hay prefer a pH near the neutral point but some are acid-tolerant as *Cynosurus cristatus;* others are alkali-tolerant florin (*Agrostis alba*), Kentucy bluegrass (*Poa pratensis*), and the little-used *Festuca elatior;* Canada bluegrass (*Poa compressa*) is alkaline loving; while still other grasses can tolerate both acid and alkaline conditions, as *Festuca ovina, F. rubra,* and *Anthoxanthum odoratum.*

Soil pH and Cereals

The principal grain crops are mostly alka-tolerant including most wheat varieties, barley, maize, sugar cane, and some varieties of oats. Most varieties of oat are acid-tolerant, while rye tolerates both acids and alkaline conditions.

Plants Requiring a Decidedly Acid Soil

The following plants prefer or demand a soil as acid as pH 6.5, and thrive best at pH 4 to 6:

Azalea	Marigold
Bayberry	Mountain laurel
Blackberry	Oak
Blueberry	Peanut
Butterfly weed	Pecan
Cardinal flower	Pink
Chrysanthemum	Potato
Cranberry	Radish
Flax	Raspberry
Heath	Rhododendron
Heather	Spruce
Huckleberry	Sweet Potato
Lupine	Traling arbutus
Lily	Watermelon
Lily of the Valley	Yew

Plants Requiring a Slightly Acid Soil

The following plants require a somewhat acid soil but can tolerate a neutral soil:

Apple	Gypsophila
Balloon Flower	Gold-banded Lily
Blazing Star	Lupine
Butterfly Weed	Nicotiana
Cornflower	Pansy
Gardenia	Pumpkin
Gloxinia	Rice
Redtop Grass	Turnip

Alkaline Soil Plants

Moderately alkaline soil favors the growth and productiveness of many garden plants. The use of lime, wood ashes, and some of the natural rock flours create or increase the alkalinity of the soil. Certain alkaline-soil plants as peas, clovers, and alfalfa may become stunted or even sickly in acid soil. The more common alkaline-soil plants in the garden are listed below.

Alyssum	Lettuce
Asparagus	Mignonette
Bean	Nasturtium
Beet	Onion
Cabbage	Parsnip
Carnation	Pea
Cantaloupe	Phlox
Cauliflower	Rhubarb
Celery	Salisfy
Cucumber	Squash
Geum	Sweet Pea
Iris	

Neutral Soil Plants

All garden and crop plants not included in the lists above prefer a neutral soil.

Compost and the pH of the Soil

Humus functions as a buffer in the soil. Garden and crop plants are far less dependent upon a specific pH in the soil when there is an abundant supply of humus. For instance, potatoes require a distinctly acid soil when the humus content is low. In less acid or neutral soils low in humus, potatoes are highly susceptible to potato scab. In practical potato growing it often is desirable to follow potatoes by crops which will not tolerate soils that are too acid, as cabbage, cauliflower, and Brussels sprouts. According to Hugh A. Ward (The Organic Farmer, August, 1949) with the application of compost and the accompanying low soil acidity (pH 6.0 to 6.8), it becomes possible to follow early potatoes with cauliflower, or Brussels sprouts which are transplanted in the fields in late July or early August for harvesting in October and November. If it is not desirable to grow these other vegetable crops after potatoes, the pH of the soil is favorable for such legumes as vetch and cowpeas for increasing the nitrogen content of the soil. Mr. Ward also reported that he can grow potatoes free from potato scab in a soil having a pH as high as 7.2 when he has plenty of humus in the soil. This observation emphasizes the importance of soil pH on the occurrence of plant diseases in general, and also the need for humus in the soil.

pH and Plant Diseases

The relations of pH to plant diseases involves both the pH of the soil and the pH of the sap and tissues within the plant. Many bacteria and fungi tend to change the pH of the medium in which they grow. Many disease-producing bacteria may raise the internal pH of a living host, while numerous acid-producing saprophytic bacteria lower the pH of their medium. Disease-producing fungi seem to decrease the internal pH of plants.

Plants with very acid juices are reported to be immune to crown-gall. Fungi are more acid-tolerant than bacteria. The metabolic "health" of plants attacked by disease-producing fungi and bacteria seems to depend to some considerable extent upon the relation between the metabolism of the plant and the pH value of the soil solution from which it absorbs its inorganic materials. In soils low in humus the finger and toe disease of turnips is rare when growing in soil above pH 7.0, corky scab of potato does not develop in soils having a pH below 6.0, potato scab is rare in soils below pH 5.2, violet rot is uncommon when the soil pH is above 7.0, heart-rot of beet is rare below pH 6.7, wilt of tomato is minimal at a pH above 7.4, and the black root-rot of tobacco is rare in soils with pH below 5.5.

Wood Ashes for Azalea?

Q. My azaleas are not making the growth I expected they would after I fertilized them with compost made with plenty of wood ashes. Can you advise me on this matter?

A. Under no circumstances should wood ashes be used in the compost to be used to fertilize azaleas and other acid-loving plants. Wood ashes are strongly alkaline and should be used only in compost intended for plants which thrive in neutral or slightly alkaline soils.

Gypsum to Increase Soil Acidity

Q. Do you recommend the use of gypsum to increase the acidity of soil?

A. Ordinarily, no. Gypsum contains sulphur which may accumulate in the soil in injurious amounts. Gypsum leads to the burning up of humus and leaving the soil dead so that it hardens in much the same way as cement, especially if the soils contain clay.

Acid Compost

Q. How can acid compost for such acid-loving plants as azalea, blueberry,, and camellia be made?

A. An acid compost can be made by substituting acid peat for soil and omitting the lime, wood ashes or other alkaline materials from the compost heap.

Humus and Soil Acidity

Q. How does humus affect the acidity of the soil?

A. Humus is an efficient buffer, and makes plants much less dependent upon a specific or narrow pH range. In other words, most plants become more or less acid-tolerant and alkaline-tolerant in soils rich in humus.

Q. Do grapes require lime? I have many books and pamphlets on gardening but have never found the answer to this question.

A. It would only be as the result of some very unusual soil condition that lime would be required by grapes.

Soil pH and Potatoes

Q. According to an analysis of the Connecticut Experiment Station, my soil is too alkaline for potatoes. How can I overcome this?

A. The analysis indicates that your soil is low in nitrogen so that it must be concluded that your compost was not properly made. It would be well also to omit the lime in compost to be used for potatoes. A pH of 6.7 is not necessarily too high for potatoes if the soil contains adequate amounts of humus to act as a buffer against acidity and alkalinity.

Acid Soil

Q. I believe that the soil in my garden is acid. How can I test it, or how can I be sure that it really is acid?

(*Continued on page* 59)

Sir Albert Howard Encouraged Dhar

Copy of letter dated the 23rd of January, 1947, from Sir Albert Howard, C.I.E., M.A., to Prof. N. E. Dhar, D.Sc., Head of the Chemistry Department, Alahabad University, Alahabad, India.

"I AM most interested in your work on nitrogen fixation in Nature, 11th January, 1947. You have got on to a very good wicket and I do hope you will be able to find time to pursue the subject to the bitter end. Anything you write about it, be sure and send me as I would like to notice the result in *Soil and Health* (copy enclosed).

"I often come across cases of nitrogen fixation, both in compost heaps and on the land, but I have never had time to follow up the work in detail. You can do so and I feel sure you are on the eve of a very important contribution to agricultural science."

This note came in the mail from Professor Dhar and it was too late to incorporate into the place in this issue where it should have gone, probably in the article entitled *Explanation of the New Organic Method*, on page 33. It bears out exactly what I have said about Sir Albert Howard. I had never met this learned scientist, but I knew him well. His primary interest, which amounted almost to an obsession was the health and well-being of man-kind. We exchanged hundreds of letters across the ocean. He was happiest when some new development occurred to advance the organic method. I saw it again and again in our correspondence.

So he *did* know about Dhar's work, and had read a complete account of it which appeared in the publication called Nature, in 1947. He encouraged Dhar in a picturesque manner by saying, "You have got on to a very good wicket," wicket being a term used in the English game of cricket. Sir Albert admitted he had noticed the phenomen of nitrogen fixation on the land, but that he had never had the time to follow up the work in detail. He died in the following year. Were he alive today I am sure he would encourage research to prove or disprove Dhar's work, and this is what must be done.

J. I. RODALE.

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Please order these books direct from publisher.

How To Eat Safely In a Poisoned World by Anton Jensen (Universal Press, P. O. Box 1586. Lincoln 1, Nebraska. Paper bound. 80 pages. 1949. $1.00.)

With food plants being grown in highly chemicalized soils and sprayed with large doses of poisonous materials whose possible injuries to the human body have as yet been unexplored, it is becoming increasingly difficult to eat safely and maintain a healthy body. This small book clearly outlines the dangers which attend the use of strong chemical fertilizers in the soil and the heavy applications of arsenic and other poisons in attempts to control insects and diseases. The author points out foods that may be eaten safely in addition to those which the organic gardener can grow in his own garden.

The Plant in My Window—An Adventure of the Spirit by Ross Parmenter. (Thomas Y. Crowell Company, 432 Fourth Avenue, New York 16, New York. 1949. $2.50)

This book tells an interesting story about a plant that was left behind by a former tenant. It was not a particularly valuable plant, but there it was. It had been abandoned to shift for itself in an empty apartment. Because it was a living, growing organism the new tenant could not throw it out. At first he cared for it only indifferently and occasionally as he remembered to do so. To get it out of the way, the plant was placed on the sill of a window having a northern exposure. There he was prompted to sketch it, and it was the sketching that focused his attention and sharpened his vision. That a neglected plant could respond so dramatically to light and water was a new idea and gave new purpose to all of life. This book tells in an interesting way of the effect a lowly plant had on the intellectual and spiritual growth of a man. Cloth bound. 148 pages.

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MAKE FRIENDS WITH YOUR LAND—A Chemist Looks at Organiculture by Leonard Wickenden (Devin-Adair Company, Publishers, 23 East 26th Street, New York 10, New York. 1949. $2.50)

This book gives an interesting account of a typical gardener well versed in the commonly accepted garden practices who dared to make scientific tests of the various claims of organic gardening. Like most well-informed gardeners, he was sceptical of the theories and claims of the organiculture enthusiasts. He put the claims to scientific tests in garden and in the field. His scepticism has changed to enthusiasm, based entirely on results and on his observations of the *what* and *how* and *why* of organic fertilization.

The author has set forth in an interesting manner the wonders which are performed by the billions of organisms in the soil. It is all so simple. The organic matter feeds these soil organisms which make available for plant life the nutrients, vitamins, and antibiotics which insure health in the soil, health in the growing plants, and health in animals and man. Organically enriched soil is indeed living. It is so densely populated that New York City, by comparison, seems like a deserted village. There are more living organisms in a pinch of soil held between the thumb and forefinger than there are people in the entire United States. Without soil organisms other forms of life on the earth would be impossible. There would be no food for organisms, no wood for shelters, no fiber for clothing, no flowers for beautifying the earth, no green carpet over the earth. All would be desolation!

This is a book for all gardeners, and especially for those who have been told that artificial and costly chemical fertilizers and poisonous sprays are necessary for farming and gardening. Read the story of how one sceptical gardener dared to try organiculture, like the sinner who came to scoff but remained to pray. The author, a chemist, tells how he became disillusioned, when diseases became more abundant in spite of more and better sprays. This man's experiences may be shared by all who will but read his book.

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MRS. B. M. HALVERSON
Route 1, Onalaska, Wisconsin

for the purpose of organizing the club mentioned above.

....with Dr. Wm. H. Eyster

COMPOST WITHOUT MANURE

Q. I have lots of cuttings from the fernery, weeds, and leaves. Can I convert these materials into a good grade of compost without manure? I want to compost my orange trees which have abnormally yellow leaves.

H. B., Pomona Park, Fla.

A. Plant materials such as you mention can be converted into compost without manure by cutting or shredding the plant materials and mixing them thoroughly with garbage, compost, soil, and various kinds of pulverized rocks if and as available. This mixture can be inoculated with earthworms which will do the turning and supply the manure. Or an approved activator, as Activo, B. C. A., and others advertised in this magazine may be used to break down the materials in a relatively short time.

—o—

CAMPHOR AND EUCALYPTUS LEAVES

Q. Are the leaves of such trees as magnolia, avocado, camphor tree, eucalyptus, pepper tree, and walnut suitable for composting and mulching?

Mrs. E. B. H., Altadena, Calif.

A. The leaves of all trees are a valuable source of organic matter and minerals. The leaves of such trees as eucalyptus, camphor tree, and walnut should be exposed to the weather for a time before using them in the compost heap. In weathering the aromatic oils, alkaloids, and other materials which might interfere with the organisms of decomposition will be leached out. If the leaves are ground by being put through a suitable grinder, they can be used directly as a mulch. Various types of leaf grinders are being described in the *Organic Gardening* magazine.

—o—

CORN SMUT

Q. What is the cause of smut in corn, and how can it be controlled?

Mrs. F. R. M., Williamsville, N. Y.

A. Corn smut is a disease caused by a fungus which lives parasitically inside the corn plant. After this fungus makes a local growth, it causes such plant parts as individual kernels of corn, the whole ear, parts of the tassel to become abnormally large and ultimately these enlarged structures become filled with fungus spores which are dark brown in color. Sometimes smut "boils" appear in other parts of the plant. The spores are scattered when the smut boils burst and infect other corn plants. Corn smut can be controlled fairly well by removing all diseased plants just as soon as they can be detected.

Seminar on Acidity and Alkalinity

(*From page* 54)

A. Certain plants are indicators of acid soil. If sheep sorrel grows in your soil you can be sure that it is acid. You can make a direct test by purchasing some litmus paper from the drug store and applying it to moist soil. If the soil is acid, the litmus paper will turn from blue to pink or red. Also small soil testing kits are available at little cost. See advertisements in this magazine.

Fertilizers for Blueberries

Q. As a subscriber to your magazine I would like to ask if you advise the use of fertilizer on blueberry plants.

A. Yes, but the right kind of fertilizer. The best possible kind of fertilizer is not costly. It is acid leaf mold or acid compost. The plants also should be mulched with such acid-producing organic materials as sawdust, pulverized oak leaves, and pine needles.

(*More on next page*)

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Tannic Acid

Q. What do you think of tannic acid as a means of acidifying the soil for acid-loving plants such as camellia and azalea?

A. It is quite impossible to say what would happen if tannic acid were used for acidifying the soil. Experiences with materials high in tannic acid are so contradictory as to toxic effects that it would seem best not to use them. The differences in effects are doubtless associated with soil differences.

Soil Acidity in Berry Patch

Q. How may the soil acidity of a berry patch be maintained?

A. To maintain acidity in berry patches, leaves could be piled in the fall as a heavy mulch. Rotted leafmold would be excellent at any time. This not only keeps the soil acid but encourages the earthworms to multiply. Another acid-producing material is sawdust. Pine needles should be used in moderation only after they have been allowed to weather for a time.

Dr. William H. Eyster

If you are interested in Mr. Rodale's articles on cancer, read ***"The Healthy Hunzas".*** This informative book describes a race of cancer-free people in the North Western section of India. Your eyes will be opened when you learn the important part farming plays in the health and prosperity of the world. Written by Mr. Rodale, this clothbound book sells for **$3.00** postpaid. ***Send for your copy today.***

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